CHAPTER 1

INTRODUCTION

Approaches To The Mind-Body Paradox And Introduction To Subsequent Chapters

Psychoneuroimmunology introduces the immune system into the psychoneurological equation of the mind-body relationship. The aim of this thesis is to define the mind-body connection in psychoneuroimmunological context in terms of the two main stress axes. It is shown that the mind-body relationship involves more than a two-way street between neuroendocrine function and behaviour and that the immune system is of paramount importance in the information flow. Behaviour is seen as biological response modifier and *vice versa*. A schematic interpretation of the psychoneuroimmunological interaction, in terms of the major stress axes, is developed and presented. The thesis is concluded by a practical example of the relevant psychoneuroimmunological interactions, followed by a hypothesis on the implications of these interactions for mental health. Chapter 1 provides a very brief overview of the major past and present approaches to the mind-body problem, some of them now only of historical interest. This is followed by defining the term psychoneuroimmunology, and a short description of the field and its origin. The chapter is concluded by a lay out of the rest of the thesis.

Introduction

The first three sections of this chapter take a brief look at developments in the mind-body concept over several centuries, without entering into the argument about the merits of the different schools of thought. It is subdivided into:

1.2 Cross-cultural perspectives on the mind-body situatedness

1.3 Current views on the mind-body relationship

Subsequent sections comprise an introduction to psychoneuroimmunology, and explain the organisation of the rest of the thesis. These sections are:

1.4 Introduction to psychoneuroimmunology

1.5 Organisation of subsequent chapters

1.1 Historical perspective on the mind-body paradigm

1.1.1 From philosophy to psychology

The mind-body paradox has been a major problem long before the formal beginning of psychology as an independent science. It is said that speculation about the origin of mental processes is probably as old as the process of thinking (1). The earliest recorded views on the origin of mental processes are those of the ancient Greeks and include the teachings of Heraclitus (6^{th} century BC) who saw the mind as an endless space and Aristotle (4^{th} century BC), who saw the heart as the centre of nervous control and as the seat of the soul (1). This concept of a physical seat or location of the mind had been addressed by many and although the brain is now generally seen as the physical basis of cognitive-emotive processes, persuasions vary with some still resembling the endless space concept of Aristotle. Over time the changing views of the mind-body link, as can be expected, largely reflected the changing physical worlds that surrounded their founders. Examples of this are seen in the views of a) Galen who saw the fluid-filled cavities of the brain as the functionally essential parts – thus reflecting then prevailing technological developments in aqueduct and sewer system construction, b) Kepler, describing the eye as optical instrument, and Willis, recognising that hearing occurs as a result of the ear's transformation of sound – the work of both reflecting the era of mechanics and c) Du Bois-Reymond who explained brain function in terms of chemical and physical principles – an outflow of the discovery of electricity by physicists (1).

Although experimental research into the mind-body relationship is generally said to have started around the 17th century, it actually dates back to the second century AD. One would have expected a certain stepwise increase in our understanding of the mind-body interaction over the ages. This, however, is only partially correct, as progression and regression in the lines of thought seem to alternate. The reason for this can to some extent be ascribed to the lack of communication, not only as a result of physical separation between investigators, but also as a result of non-communication between the various disciplines.

The majority of early mind-body positions in psychology were derived from the field of philosophy. In fact, the mind-body problem is said to be bequeathed to the sciences by philosophy. Although the positions of philosophers, psychologists and others cannot always unequivocally be defined and many questions remain as to their exact viewpoints on the matter, it is reasonable to classify the various positions, at least from a historical point of view, into three main schools of thought. Such a tentative classification, as described by Marx and Cronan-Hillix, 1987 (2), divides the mind-body approaches into dualistic, monistic and compromising:

- The position of dualism is defined as any approach that accepts a basic difference between mind and body and, by implication, a relationship to be explained. It comprises Cartesian interactionism, psychophysical parallelism and occasionalism. Cartesian interactionism, with Descartes (1641) as major exponent, assumes the mind-body association as two separate but interacting processes. The second dualistic approach is psychophysical parallelism. Psychophysical parallelism, as represented by Spinoza (1665), defined the mind-body relationship as two separate, independent, yet perfectly correlated processes. However, other definitions of the term also exist. The third variation on the dualistic position, i.e., occasionalism, assumes the mind-body connection as two separate and independent processes correlated by the intervention of God. Malebranche (1675), represents an early significant exponent of occasionalism. Several variations on the original three dualistic mind-body positions are presently in existence and some will be touched upon in later paragraphs.

- Monism, as opposed to dualism, includes all positions that ignore either mind or body or that subsume both mind and body under the same axiom. Monism, as position on the mind-body connection, includes materialism, subjective idealism and phenomenalism. Materialism, as a monistic viewpoint on the mind-body connection, postulates a single underlying physical reality. This viewpoint dates back to Democritus, 400BC. The second form of monism, i.e., subjective idealism, in contrast, presumes a single underlying mental or spiritual reality. Berkeley (1710), represents an important exponent of this sub-position (2). Phenomenalism, as represented by Hume (1740), proclaimed that neither mind nor body exists, only ideas derived from sense impressions (2). Some of the contemporary variations on monism are discussed later in this writing under *current views of the mind-body relationship*.
- A third group of approaches on the mind-body connection, in addition to dualism and monism, can be seen as the compromises. The two main schools of thought classified under compromises are the double-aspect view as represented by the assumptions of Russell (1915), and epiphenomenalism with Hobbes (1658) as major early exponent. The double-aspect view or dual-aspect theory assumes mind and body to be a function of one underlying reality, while the epiphenomenalistic sub-position sees mind as a non-causal by-product of the body (2).

The above classification provides a degree of order to the different viewpoints on the mind-body dilemma. It does, however, introduce its own problems. One major stumbling block in classifying viewpoints according to the above classification lies in the changing concepts of the definitions on the positions and sub-positions. An example of this is seen in the perception of the dualistic approach of psychophysical parallelism. Psychophysical parallelism, as represented by Spinoza (1665), is generally said to define the mind-body relationship as two separate, independent, yet perfectly correlated processes (2). Some interpretations, however, define psychophysical parallelism by saying, amongst others, that every mental process coincides with a neurophysiological process – without specifying either a causal or non-causal relationship between them (3). The latter renders the whole concept hanging and makes it impossible to differentiate between psychophysical parallelism and monistic sub-positions. It is obvious that a causal

relationship would move psychophysical parallelism beyond the dualistic position. The same confusion exists with regard to Cartesian interactionism. Recent analysis of the work of Descartes suggests that his position might have been misinterpreted for quite a while (4). In an article by Duncan, 2000 (4) the philosophies of Descartes are compared to the modern biophysical model of pain and similarities are pointed out, stressing the fact that the present view of what Descartes said is quite different from what was originally intended. The question is, not unjustifiable so, asked in what respect contemporary theories represent, in philosophical terms, significant advances over that of Descartes. Similar variations in conceptionalisation of viewpoints can be found for both the monistic approach and for the compromises. The double-aspect view, or dual-aspect theory is, for instance, said to have assumed mind and body to be a function of one underlying reality (2), while others define the position's viewpoint as seeing the mind and body as two aspects of the same thing (5). Should mind and body be understood as two aspects of the same then the double-aspect view approaches the reductionistic present day version of materialistic monism. The same dilemma applies to epiphenomenalism. The epiphenomenalistic subposition is said to see mind as a non-causal by-product of the body (2). However, current psychological dictionaries define epiphenomenalism as the view that psychological processes are merely by-products of neurological processes without any influence on the body or on subsequent psychological events (6). The latter definition once again has a strong leaning towards materialistic-monism.

The three positions touched upon in the previous paragraphs are, with some additional comments, summarised below:

Dualism (assumes the existence of a basic difference between mind and body):

- *Cartesian interactionism* (mind and body separate but interacting – debate on whether this definition really concurs with Descartes' intentions).
- *Psychophysical parallelism* (mind and body separate, independent, but correlated. Also defined as every mental process coinciding with a neurological occurrence, a definition, but for the causality, not that far removed from the monistic approach).

- *Occasionalism* (mind and body separate, independent, correlated by the intervention of God – a view still adhere to in certain religious circles).

An easy way to understand the difference between the three types of dualisms is to look at the factors said to mediate the interaction between mind and body: in Cartesian interactionism there is a mutual influence, in psychophysical parallelism mind and body are created to function in unison and in occasionalism the functioning of mind and body are correlated by the influence of God or, as also referred to, by a Skilled Workman.

Monism (an approach which ignores either mind or body or subsumes both under the same rubric):

- *Materialism* (single underlying physical reality to mind and body – the major current perspective, sometimes seen as too reductionistic. Further subdivisions or versions are touched upon later in this chapter).
- *Subjective idealism* (single underlying mental reality to mind and body. Also been referred to as immaterialism or mind-stuff).
- *Phenomenalism* (no mind or body exist – only impressions).
- *Neutral monism (Sometimes seen as compromise. See compromises for dual-aspect).*

Compromises

- *Double-aspect view* (mind and body seen as a function of one underlying reality. In the 17th century version God is seen as the one and only underlying reality. In the 19th century version it is known as dual-aspect monism or neutral monism where mind and body are seen as different aspects of the same "stuff" – different aspects of the same psychophysical process.)
- *Epiphenomenalism* (mind seen as non-causal by-product of body – also defined as mind being a by-product of neurological processes, unable to reflect back onto nervous system - once again moving towards the materialistic monistic approach)

It is interesting to note that every one of the above versions of explanation on the mind-body relationship still has it's following and that most of the current, apparently new approaches are to a certain extent variations on one or more of the above.

1.1.2 Approaches from the schools of psychology

The mind-body problem has to some extent, been addressed by almost all schools of psychology – many of the earlier schools still leaning heavily on arguments from the discipline of philosophy. The latter statement is especially relevant with regard to associationism, a school with its origin firmly rooted in philosophy. Associationism defined the processes of the mind as products of learned associations between smaller elements such as simple ideas and sensations (7,8). Antecedent associational influences from philosophers including Hobbes and Berkeley were mentioned earlier under the heuristic discussion of the major historical positions of philosophy on the mind-body connection. Important exponents of associational psychology include the assumed founder David Hartley (1705-1757), as well as developers such as Thomas Brown (1778-1820), James Mill (1773-1836), John S Mill (1806-1873), Alexander Bain (1818-1903), Hermann Ebbinghaus (1850-1909), Ivan Pavlov (1849-1936), Vladimir M Bekhterev (1857-1927), Edward Thorndike (1874-1949) and Edwin R Guthrie (1886-1959) (9). Several philosophical arguments but no clear point of view on the mind-body problem would appear to be derived from associationism. Edward Thorndike, generally seen as an important exponent of associationism, largely preferred to ignore the problem and made no significant formal statement on the problem The closest one can probably come to a formal statement on the problem is a writing from his student days:

The real absurdity is to settle beforehand what mind or matter can cause without empirical study of the phenomena of the connection between mind and body. No one proves that causation is impossible between heterogeneous orders of being just by saying so in a loud enough voice. And the psychologist who affirms without other reason that because the mind moves the particles of the brain, it must be material, like a pumpkin, has a mind that is enough like a pumpkin to partially justify him.

Joncich, 1968, p139 (10 as quoted in 9).

Structuralism, in an attempt to decipher the modes or structures of associations, analysed consciousness or awareness in terms of its simplest elements (11,12). From the school of structuralism one ought to look at the mind-body positions of, at least, Wilhelm Wundt

(1832-1920) (13) and that of Titchener (1867-1927) (14). Wundt, the founder of structuralism, despite his emphasis on experimentation and his writing of *Principles of Physiological Psychology (1910) (15),* had a great interest in philosophy and his position on the mind-body connection is therefore often classified along the lines of philosophy (13). Having said that, it is necessary to note that some confusion still exists as to his actual place amongst theorists on the problem. Wundt saw mind and body as parallel, but not interacting systems. Wundt has been described by Boring (1950) as dualist, by Blumenthal (1980) and Richards (1980) as identity theorist (as he described himself), with mind and body as two aspects of the same underlying identity, and by Hoorn and Verhave (1980) as parallelist, an opinion based on the nature of his work (13). Titchener, another major exponent of structuralism is, although of British origin, considered to be the founder of the American brand of structuralism (14). With minor differences Titchener's position on the mind-body connection is in agreement with that of Wundt in that both concurred mental and physical events as running along parallel courses (16). Their opinions on whether the mind-body relationship is monistic or dualistic may, however, have differed. Indications that Titchener's position should be seen as monistic, as opposed to a more dualistic leaning on the side of Wundt, can be derived from the following quotation:

> *The metaphysics to which Science points us is rather a metaphysics in which both matter and spirit disappear to make way for the unitary concept of experience.*
>
> *Titchener, 1899 (17 as quoted in 16).*

Whether this implied monism reflects an idealistic theory, where consciousness is the only reality, or an identity theory, where the nature of the reality (mental or physical) is not specified, is not clear and of little importance. It is at this point perhaps interesting to note Titchener's views on the meaning of mind and on that of consciousness. He defined mind as the sum total of a persons experiences from birth to death as opposed to consciousness that he defined as the sum total of experiences at any given time (14). This view would even today make sense.

In the school of functionalism, as in most other schools of psychology, opinions about and interest in the mind-body association varied widely. In contrast to structuralism, functionalism focussed on the functional contributions of larger psychological units of behaviour as a means of adaptation to the environment (18,19). In trying to understand the general trend in the mind-body approach of functionalism, it is relevant to remember that scientists such as Sir Francis Galton (1822-1911) and Charles Darwin (1809-1882) were among the antecedent influences on functional psychology – a fact that may very well have been a major determinant in their mind-body approaches. The school of functionalism shows a typical progression-regression pattern in the development of the understanding of the mind-body connection. Major advances are derived from the work of William James (1842-1910) (20). Important accomplishments by William James, pertaining to the mind-body connection, include the James-Lange theory of emotion, his work on the connection between consciousness and neurons and his point of view that consciousness cannot be considered as apart from the body. James therefore can be classified with more recent psychologists who see the mind-body connection as one of interaction, or perhaps rather of unity. One further aspect of his work that should be mentioned in relation to the mind-body interaction is that of adaptation. Not only did he believe in physical adaptation to the environment but, in addition, brought in instinct, memory, attention, habit, choice, as well as the relationship between these different functions (20). This, at first impression, places him right there with many modern day neuroscientists. His later conclusions are, however, not that simple and will be returned to later in this text. Most functionalists, other than William James, contributed very little to the study of the mind-body problem. In fact, developments during this period was in a constant state of fluctuation and positions varied from parallelism to the feeling that psychologists don't need to concern themselves with metaphysical problems, to simply assuming the psychophysical interaction without further questioning (21). The latter approach especially applied to a group of functionalists that included Harvey Carr (1873-1954) and several others, who did not see the mind-body connection as a problem and simply accepted the psychophysical integration (21). This approach is also seen in many of the cross-cultural and post-modernistic perspectives to be discussed later.

Behaviourism, best known for its stimulus-response approach, comprises two major approaches to the mind-body link. Empirical or methodological behaviourism that had very little interest in the mind and focussed only on observable behaviour, and radical or metaphysical behaviourism that denied the existence of the mind (22, 23). The latter form of behaviourism can be seen as a form of physical monism. The behaviourist school of psychology (24) was, in its quest to define the mind-body relationship, perhaps most severely handicapped by the concept of *consciousness* and, to a lesser extent, the concept of *mind*. Many behaviourist declined to investigate the meaning of *consciousness* or *mind* and would not attach much importance to either of these issues. Typical behaviouristic remarks include:

The plans that I most favour for psychology lead practically to the ignoring of consciousness in the sense that that term is used by psychologists today. I have virtually denied that this realm of psycics is open to experimental investigation. I don't wish to go further into the problem at present because it leads inevitably over into metaphysics.

Watson, 1913 (25 as quoted in 24).

Consciousness is a purely personal experience and has no scientific value or validity unless it is expressed in some form of behaviour.

Weiss, 1917 (26 as quoted in 24).

By 1924 Watson concluded that the existence of consciousness is totally improvable and that those who wants to introduce it either as an epiphenomenon or an active form into the physical or chemical body is motivated to do so by spiritual or vitalistic notions (24).

Other extreme positions from the school of behaviourism include the tendency to completely reduce the mind to physiological function, the denial of the existence of consciousness, the argument against a connection between body and mind based on the assumption that the interaction between non-physical events with physical events violates the principle of the conservation of energy, and radical physical monism postulating mental as a mere description of the mode of action of physical events with no room for

the existence of an independent consciousness (24). In summary it can be said that several positions appealed to individual behaviourists, most preferring to take a strong position on the dilemma without a need to study either mind or consciousness.

Gestalt psychology, with founder exponents like the psychologists Max Wertheimer (1880-1943), Kurt Koffka (1886-1941) and Wolfgang Kohler (1887-1967), has often been said to try and sidestep the issue of mind-body connection (27). The validity of such a statement is, however, questionable. In line with the primary postulate of gestalt psychology that states the whole to be primary to and different from the parts, gestalt psychology implies mind and body as a functional unity - which minimizes rather than evades the problem. This assumed position of mind-body as an integrated unit has on occasion been critisized as in contradiction to what is seen as their particular understanding of the principle of isomorphism (the concept that each psychological process is accompanied by a neurophysiological process) - arguing that their position rather leans towards dualism (29). Whether meaningful or not, the latter approach to the gestalt position was in turn criticised by the view that isomorphism was not intended as an explanation of the mind-body relationship. To quote Prentice, 1959 (29):

Let me say once and for all that the concept of isomorphism is not an attempt to solve the mind-body problem in its usual metaphysical form. It takes no stand whatsoever on whether mind is more or less real than matter. Questions of reality and existence are not raised at all. Mind and body are dealt with as two natural phenomena whose interrelations we are trying to understand. It comes nearest perhaps to what has sometimes been called the double–aspect theory, the view that cortical events and phenomenal facts are merely two ways of looking at the same natural phenomenon, two faces of the same coin. Prentice, 1959 (29)

Despite the arguments of Prentice many are still of the opinion that isomorphism does in fact offer a specific solution to the mind-body body problem – a way of integrating the mind with the rest of the world (30). Whatever the finer points of argument, it can unequivocally be said that the gestalt position on the mind-body situatedness is that of a

unitary, integrated organism. Whether an argument on gestalt isomorphism should even be entered into is a mute point. The mere fact that Gestalt isomorphism, i.e., the idea of a functional correspondence between brain processes and their correlated percepts (31,32), forms an integral part of their approach should surely be enough to accept that they saw mind and body as a unity.

With the many prominent psychologists from the school of psychoanalysis it is rather difficult to summarise one specific position for psychoanalysis on the mind-body dilemma. It is therefore perhaps suffice to confine the discussion to the approach of Sigmund Freud (1856-1939) as founder. Freud himself declared his approach as psychophysical parallelistic - and therefore as dualistic, but according to Jones (33 in 34) different passages from Freud could alternatively put Freud in any of a number of philosophical mind-body positions. Apparently not taken into account when classifying Freud's position with regard to the mind-body connection, but relevant to some present day mind-body positions, is his work on the role of childhood experiences and genetics. In considering this, as well as his occupational training, one would expect to classify Freud under the compromise approaches. There would, however, appear to be general consensus that Freud, and most other psychoanalyst fit best in some form of dualism (34).

In the above short historical overview very little was said about the history of the American perspective on the mind-body situatedness. One name that has, however, been mentioned, i.e., that of William James (1842-1910), who can surely be considered as one, if not the, most important figure in search of the mind-body connection over that period. Author of several books and articles, including *Principles of Psychology*, 1890 (36), *Exceptional Mental States*, 1896 (37), *Varieties of Religious Experiences*, 1902 (38), *Does Consciousness Exist?* 1904 (39), *Philosophical Conceptions and Practical Results*, 1898 (40) and *Pragmatism, A New Name for Some Old Way of Thinking*, 1906 (41) James is today still considered as one of the most eminent American thinkers in the field. Although he is said to have anchored the study of consciousness to experimental physiology (35), he later went on to formulate a philosophical epistemology intended to diminish the supremacy of scientific materialism. Despite his many contributions James

never really committed to a definitive point of view on the mind-body problem. It can at best be said that he settled provisionally, in a rather tentative way, on a pragmatic empirical parallelism.

The previous paragraphs gave a synoptic overview of the history of the mind-body dilemma. It is perhaps easier to view this history in context to other developments, including that of the biological and other sciences. As such a discussion would be way beyond this introductory writing a chart has been compiled (Figure 1.1, p14) which facilitates the contextual understanding of the various developments on the mind-body association. The information incorporated into Figure 1 was extracted from a comprehensive document by Wozniak, 2002 (35), based on the catalogue accompanying an exhibition of books from the collections of the National Library of Medicine held in honour of the Centennial Celebration of the American Psychological Association. As the references were taken directly from the catalogue of the exhibition they are, for interest sake, included as an appendix to the normal reference list at the end of this chapter.

1.2 Cross-cultural perspectives on the mind-body situatedness

The previous paragraphs focussed on what could perhaps largely be seen as a historical perspective on the mind-body association from a Westerner's point of view. It would, however, be wrong not to touch upon some cross-cultural perspectives before attempting to summarise some of the major current Western First World views on the mind-body relationship. The different approaches of the various cultures to the mind-body connection are often totally intertwined with their religious practices. In scanning cross-cultural perspectives it becomes clear that language, symbols and the perception of the words *consciousness* and *mind* are other major determinants of the mind-body perspectives of specific cultures.

THE MIND-BODY PROBLEM FROM DESCARTES TO FREUD

Mind, Brain and Adaptation:
The Localization of Cerebral Function

Many of the Old Greeks already saw the brain as the centre of mental activity, but various other views about the localization of mind existed, including that of the pneumatic physiologists in which mental capacities were said to reside in the fluid of the ventricles and the Tabula Rasa point of view that saw the psyche of the neonate as a blank sheet written on by sensory experience.

The 19th Century witnessed the rise of the functional localisation proper (specific mental processes became associate with discrete brain areas)

Franz Josef Gall (1758-1828)
Anatomie et physiology du système nerveux en général (Gall and Spurzheim, 1810) (12)
The correlational approach of localization.
They described the cranioscopic method of locating mental faculties (correlations of variations in external craniological signs with character).

Several workers subsequently tried experimentally to localize function through lesioning by trephine aperture but the damage to the brain was too severe to make proper associations.

Marie-Jean-Pierre Fluorens (1794-1867)
Recherches expérimentalis sur les propriétés et les fonctions du système nerveux (1924 ed1,1942 ed2) (13).
Redefined experimental function-localisation coupling by uncovering area to be ablated with less damage.
Articulate difference between perception and sensation and localized sensory functions in sub-cortical areas. Postulated that higher brain functions occur as integrated function of cerebrum.

Alexander Bain (1818- 1903)
The senses and the intellect (1855)
The emotions and the will (1959) (14).
Defined sensory-motor associationism.
Paved the way for functionalist psychology of adaptive behaviour.

Herbert Spencer (1820-1903)
The Principles of psychology (1855) (15)
Evolutionary psychophysiology.
After reading Lewes become interested and eventually grounded psychology in evolutionary biology with key principles of cerebral adaptation, continuity, and development defined mental phenomena as adaptations. His key words: adaptation, continuity and development.

Paul Broca (1824-1880), Gustav Theodor Fritsch (1838-1927) And Eduard Hitzig (1838-1907)
Remarques sur le siége de la faculté du langage articulé, suivies d'une Observation d'aphemie (Broca, published in Bulletins de la Société Anatomique De Paris,1861) (16). Ground breaking paper published in Archiv für Anatomie, Physiologie, und wissenschaftliche Medicin (Fritsch &Hitzig1870).
Electrophysiology as technique (galvanic) for experimental exploration of function localisation.
This paper overturned the idea that functional localisation of the brain function was not possible. Provided the necessary experimental techniques and research findings for the extension of sensory-motor associationism and evolutionary psychophysiology to the cortex and identified a number of anatomical-functional relationships pertaining to the cortex.

John Hughlings Jackson (1835-1911)
Writings of John Hughlings Jackson (2 vols 1931, 1932)
Clinical and Physiological Research on the Nervous System (1875) (17).
Milestone in the integration of associative psychology with sensori-motor physiology.
A physician whose sensori-motor research focussed on clinical and physiological research. Speculated that all mental symptoms must be the result of lack of, or disorderly development of sensori-motor processes.

David Ferrier (1843-1928)
Experimental researches in cerebral physiology and pathology (a paper in: West Riding Lunatic Asylum Medical Reports, 1873), The Functions of the Brain (1876) (18).
Confirmed the work of Jackson by controlled ablation and Faradic stimulation.
Helped to confirm sensori-motor analysis as basic explanatory medium in both psychology and physiology.
Psychologist , at Heidelberg at the same time as Helmzholtz and Wundt (1964) and as physician, initially as assistant to Laylock, who articulated unconscious cerebration, Influenced by Spencer, Bain and Jackson.

Idea of soul related to brain found in work of Pythagorus, Hippocrates, Plato, Erisistratus, Galen, others

René Descartes (1596-1650)
French mathematician, philosopher, physiologist
De homine (1), Meditationes (2) and Les Passions de l'ame (3).
Father of the dualistic ((two-substance) view of mind and body (Cartesian impasse - the metaphysical split between mind and body).
First systematic account of mind/body relationship saw pineal gland as the contact between the body and the soul. Showed that body influences mind and mind influences body.

17th Century Reaction to Dualism of Mind and Body

Géraud de Cordemoy
Le discernement du corps et de l'ame (1666)
Preceding influence on occasionalism.

Nicolas Malebranche (1638-1715)
De la recherche de la vérité (4).
Most important influence of occasionalism.
Mind as well *as body is causually ineffective and can't influence* each other - God is the only true cause of experience.

Benedictus de Spinoza (1632-1677).
De ethica in his *Opera posthumus* , 1677 (5)
Rejecting Cartesian interactionism, coined double-aspect theory.
Mental and physical are simply different aspects of the same substance the substance being God which is the universal essence of everything. Mind can't influence body and body can't influence mind, but they are coordinated and connected by the Divine Influence.

Gottfried Wihelm Leibniz (1646-1716)
Système nouveau de la nature (1695) Eclaircissement du nouveau sisteme (1696)
Psychophysical parallelism of mind-body theories.
Retains dualistic separateness but with correlation between the two. Rejected interactionism (mutual influence) as well as occasionalism (a third regulatory influence) in favour of parallelism (primarily created to operate in unison) as source of the mind-body correlation. In this he saw a divine influence but at creation rather than on a continium.

18th Century: Mind, Matter and Monism

George Berkeley (1685-1753)
A treatise concerning the principles of human knowledge (1710).
Immaterialism (matter is only a perception)
There is no mind-body distinction the body is merely the perception of the mind. (This is to resurface as *mind-stuff* in the 19th century).

Julien Offray de la Mettrie (1709-1751)
Histoire naturelle de l'ame (1745), L'homme machine (1748) (6)
Materialism (matter is fundamental mental events causally dependent on bodily events)
Voluntary processes and conciousness can only be distinguished from involuntary instinctual processes by the complexities of their underlying mechanical substances. (Extreme version: Partially extended the concept of physical automata, as ascribed to animals by Descartes, to humans; Moderate version: mental processes not reductionistic related to neural processes).

Pierre Jean Georges Canabis (1757-1808)
Rapports du physique et du moral de l'homme (1802) (7)
Most ardent materialist of the French enlightenment.
Saw the brain as special organ designed to produce thoughts.

19th Century: Mind and Brain

Mind-body problem a central interest with emphasis on:

Progress in understanding the localisation of cerebral function

Mental believes, that suggestions, mesmeric trance states, psychic trauma, etc, can change the body

Most of the major theories of the 19th century (epiphenomenalism, interactionism, dual-aspect monism, mind-stuff) are variations on previous mind-body theories generally intended on dealing with the Cartesian impasse.

Shadworth Holloway Hodgson (1832-1912)
The theory of Practice (1870) (8)
First modern description of epiphenomenalism.
Mental states seen as non-causal by products (epiphenomena) of body incapable of reflecting back to influence nervous system.

Thomas Henry Huxley (1825-1895)
On the hypothesis that animals are automata and its history (1874)
Principles of Mental Physiology (1874) (9)
Popularised the epiphenomenalistic view
States of consciousness are merely the result of molecular changes in brain substance upon attainment of the prerequisite degree of organisation - supporting nervous system is independent of accompanying mental state.

William Benjamin Carpenter (1813-1885)
Principles of Mental Physiology (9)
Said to be foremost proponent of interactionism.
Convinced of a causal relationship between the brain and mental states such as consciousness, sensations, instinct and emotions on the one hand and cerebral (electrical) activity on the other. (Corresponds more to materialistic monism).

George Henry Lewes (1817-1878)
Biographical History of Philosophy (1846)
Physiology of Common Life (1859/1860), Problems of Life and Mind (1874-1879) (10)
The Physical basis of the Mind. In: Problems of Life and Mind (1874-1879) (10)
Father of classic modern dual-aspect monism (neutral monism).
His version of the double-aspect view is known as neutral monism, i.e., there is only one kind of substance (stuff) mind and body differ only in the arrangement of the "stuff" or in the way it is perceived. Mind and body are thus different aspects of the same psychophysical process. He did, however, argue against extreme reductionism.

William Kingdon Clifford (1845-1879)
On the Nature of Things in Themselves (published in Mind, 1878)
Coined the term:Mind-Stuff. Mind-Stuff monism is the position of psychical monism.
where the mind is the only real substance.
Kingdon put together the bits and pieces on the ideas of mind-stuff Pieces of brain material (mind-stuff) forms consciousness (they do not in themselves contain consciousness) - mind is the only actual substance and the material world is nothing more than an aspect in which mind is apprehended.

Morton Prince (1854-1929)
The Nature of Mind and Human Automatism (1885) (11)
Mind-Stuff theory. Gave the clearest exposition on the mind-stuff position.
He saw the psychical monism of mind-stuff as a modern form of immaterialism.
"There is only one substance, mind ; and the other apparent property-------".

Williams James (1842-1910)
The Principles of Psychology (1890)
Settled in a rather tentative way on a provisional pragmatic empirical parallelism.
Having critisized the automaton theory and the mind-stuff approach he declared himself reluctant to commit to any unsafe hypothesis.

Trance and trauma: Nervous System Disorders and the Subconscious Mind

Over 100yrs psychological studies showed that mental events Including suggestions, mesmeric trance states, psychological trauma, catharsis, emotional trauma, and submergence of part of the consciousness into the subconsciouss can dramatically influence the body

Franz Anton Mesmer (1734-1815)
Mèmoire sur la dècouverte du magnétisme animal (1777) (19)
Magnetism as basis for treatment
Believed that a physical magnetic fluid connected everything, including the human body and that physicians could redirect the magnetic flow if disturbed. His work discredited by Bailly and his own failures.
Rapport des Commissaires chargés par le Roy de l'examen du magnétisme animal (Bailly JS (ed). Paris: Imprimerie Royale, 1784).

Armand-Marie-Jacques de Chastenet, Marquis de Puysegar (1715-1825)
Mèmoires pour servir a l'histoire et a l'établissement du magnétisme animal (1784) (20).
Said by many to be the father of modern psychotherapy.
Disciple of Mesmer. Concluded that the effects of magnetism on patients, depend on the therapist's personal belief in the effectiveness of the treatment, the will to cure and on the interaction between the therapist and the patient. Developed technique for the induction of a somnambulistic sleep state where the patient carried out the orders of the therapist without any memory of it at awakening. Mesmerism (developed/described by Puysegar, comments by Mesmer) rapidly spread through Europe and USA.

Charles Poyen de Saint Sauveur
Spread mesmerism from France to Europe, evolving into the New Thought Movement.

Europe
Abbe Jose Custodio de Faria, Etienne Felix, Baron d'Henin de Cuvillers, Alexandre Bertrand, General Francois Joseph Noizet, James Braid.

Abbe Jose Custodio de Faria
De la cause du sommeil lucide (1819)
Developer of the trance-induction method. First articulated power of suggestion.
Stressed importance of patient's will to undergo somnabulistic sleep and interindividual differences.

Alexandre Bertrand
Traité du somnambulisme (1823)
First attempt at systematic scientific research into magnetic phenomena.

General Francois Joseph Noizet & Hènin de Cuvillers
Memoire sur le somnambulisme & Le magnetisme éclairé (1854).
Described in more detail mesmeric effects in terms of suggestion and believe.

James Braid (1795-1860)
Neurypnology: or, the Rationale of Nervous Sleep, Considered in Rationale with Animal Magnetism (1843) (21).
Father of hypnotism.
Desribed physical signs of mesmerism to be a state of he nervous system due to *fixed and abstracted* attention. Coined the name *hypnotism* to distinguish it from *magnetism*.

Period of transient decline of hypnotism circa 1860 +
(Ellenberger H. Discovery of the unconsciouss. Basic Books,1970)

Auguste Ambroise Liébeault (1823-1904)
Du sommeil et des etats analogues consideres surtout au point de vue de l'action du moral sur le physique (1866) (22).
Kept the idea of hypnosis as therapeutic tool alive through period of decline.
Extracted from the writings of Noizet and republished the idea that therapeutic effects of hypnosis should be seen as suggestive phenomena. Lived near Nancy and his work was later to revive the interest in hypnosis of the founders of the School of Nancy.

Charles Richet
Du somnanbulisme provoqué (1875).
Scientific basis of hypnosis.
Physiologist said to have saved hypnosis from being a pseudoscience. Work became the basis for the research of others like Charcot.

Jean-Martin Charcot (1825-1893)
Leçons sur les maladies du système nerveux à la Salpêtrière (1872-1873) (23).
Founder of the world's foremost institute of neurology at the Salpêtrière.
Influenced by the work of Richet and Briquet (who wrote the first systematic study on hysteria,1859) distinguished, through hypnosis, between symptoms which arise from brain lesions and those which results as a result of suggestive, hysterical and post-traumatic phenomena . Articulated the existence of unconscious ideas as basis of neurosis. Contributions marred by believe that transference occurred through magnetism.

Hippolyte Bernheim (1840-1919)
De la suggestions dans l'état de veille (1884,1886) (24).
Conceptualized hypnosis as manifestation of ideomotor suggestibility - opposed the view that magnetism plays a role. Founder member of Nancy School of suggestive therapeutics.
Influenced by work of Liébeault during his appointment as physician at the medical faculty at Nancy. Believed somatic hypnotic effects to be mediated through suggestions & hypnosis, being a state where high prolonged suggestibility is induced. Members of the School of Nancy abandoned hypnotism in favour of suggestion in the waking state, i.e., "psychotherapeutics".

Pierre-Marie-Felix Janet (1859-1947)
L'automatisme psychologique (25), and other writings.
Articulated the dissociaton of consciousness, relevant mental disorders and somatic symptoms.
Employed automatic writing and hypnosis to enter the patients "automatisms". Distinguished mental states on the basis of consciousness and submergence into the subconscious. Stressed the role of patient's fixation on, and rapport with, therapist as well as patient's perception.

Joseph Breuer (1842-1925) and Sigmund Freud (1856-1939)
Ueber den psychischen Mechanismus hysterische Phänomene (1893) (26).
Beginning of psychoanalysis.
Catharsis involving guided associations to bring past trauma events into consciousness in an attempt to cure the mental and associated somatic symptoms.

KEY

Major contributions
Publications

Figure 1.1: Developments in the mind-body concept from Descartes to Freud

In the middle column the major contributors to the developments from Descartes to James are shown. The column on the left illustrates the developments in the localisation of cerebral functions during the 19th century and the column on the right shows the developments in the concept that mind states can influence somatic functions - more or less during the same period.

Some of the cross-cultural views were reviewed by Krippner, 1994 (42). Krippner (42) pointed out that many cultures don't differentiate between body and mind and that some cultures do not even have a separate word for *mind*. In fact, while Eastern, as well as some of the early South American cultures may be able to eloquently define altered states of consciousness as part of normality, Western cultures generally tend to see such experiences in terms of psychopathology.

Without going into any detail, and without pretending to any in depth comprehension of the mind-body views of other cultures, at least the following examples warrant mentioning:

- Buddhism, where volumes have been written on the mind-body interaction, especially with regard to meditative practices, and much time was and still is being devoted to the contemplation of mind and body. It is said that Buddhism sees the mind as a highly refined field of energy (43). This view approaches that of the models of modern physics. Whether the assumption that Buddhism sees the mind as a highly refined field of energy comments on the mind-body relationship is questionable as a sense of biological consciousness and emphasis on the concept of integration of mind, body and spirit permeates most of the writings on Buddhism available in English. The Tibetan Buddhist philosophy, its classification of the mind states, and the systems of meditation practices and levels, are aimed at achieving ideal states of being and need dedicated involvement to be really understood. Reaching for the ideal mind/body integrated state does, in fact, represent the life-long occupation of many Buddhists.
- The approach of the Huichol, i.e., a Mexican tribe whose views of consciousness and mind-body relationship strongly reminds one of that of some of the Eastern philosophies in the sense that they see the physical world as an illusion, and reality as a state not understood by the normal awake mind. The Huicol approach is, in this writing, referred to as an example of a cross-cultural perspective that bears some resemblance to monistic phenomenalism. It is said that the Huicol spend the majority of their lives in a kind of well-organised hallucination (42,44). Some similarity is found in South Africa where the Rastafarians use dagga in order to reach the desired mind state.

- Shamanism, a spiritualism practiced by certain North American Indian tribes, and by certain groups in Northern Asia, is known for, what is seen in Western cultures, out-of-body experiences. The Shaman concept of the *dreaming body*, that is said to have the ability to move into different realms, is seen, not as an out-of-body experience, but merely as a transient shift into another body more suitable for the task at hand (42). This would in Western cultures most probably be classified as psychopathology. One should, however, first ask whether any resemblance exists to some present day mind-body practices or even to some forms of psychotherapy, before berating them. It is important to remember that shamanism is found in Central Asia, amongst the Chinese, the Japanese, the Maori and even in Tibet, and that each region has its own variation on the general theme (45).
- Other mind-body models that, to a degree resemble monistic viewpoints, but where the ideas of reality and consciousness differ markedly from our conventional Western understanding, include the Mayan and the Aztec models (44, 46). The idea of the Aztec model being of a monistic nature is, however, somewhat belied by what is recorded as a willingness to die in order to attain the status of a liberated spirit. This concept of liberation of the spirit is not unique to the Aztec model as others, including the Australian Aborigines, are said to have their own particular practices in order to obtain this experience during their so-called primordial dreamtime (42,44,46). Some groups in Central America believed in the existence of a *counterpart in disguise.* This counterpart, often disguised in the form of an animal, was believed to have had its fate linked to that of the human through the influence of cosmic forces (46 p66).
- Other related cross-cultural variations on the mind-body position include a) the consciousness model derived from the practices and believes of Brazilian natives where each of ten bodily centers, respectively, is said to control a specific aspect of the mind-body interaction, b) the view amongst traditional Hawaiians where the physical body and three other bodies, i.e., an etheric body, an astral body and a mental body, exist, as well as a mind that can be active at the conscious, the unconscious and the superconscious level and c) the view of the Huna which considered the body to be in the mind, but the mind to be only partially in the body (42,44,47).

- Amongst the Hindu-related spiritual practices various approaches to the mind-body position exist (48). It would appear as if most of them, in common with Tibetan Buddhism, adhere to the principle of indivisibility of mind and body (48,49). It is, however, very difficult to define the term Hinduism and the above statement may not apply to all Hindus. Therapies based on Eastern mind-body unity approaches, including the so-called Eastern movement therapies tai chi, qigong and yoga, are increasingly being incorporated into Western health practices in an attempt to reach unification of mind and body (42,50). The best-known techniques adopted by the West are probably the various forms of meditation. They do not need further discussion at this point.
- The Ayurvedic approach sees mind and body as an inseparable unity where the highest levels of spiritual development are said to require a healthy body. This is referred to separately from Hinduism as those for whom the Vedic heritage represents the main expression of religion are not classified as strictly Hindu – rather as pre- or proto-Hindu (48). Ayurveda shares the principle of balance of life forces with that of Chinese and some Buddhist approaches (48,50). A commercialised version of Ayurveda has recently become the vogue, as well as big business, in the West. The mind-body view of this variation on Ayurveda would appear to approach the mind-stuff version of monism (Deepak Chopra, lecture, Johannesburg, 2002).

Although glimpses of African considerations on the mind-body paradox can be gleaned from books such as Credo Mutwa's *Indaba My Children* (51) and Parrinder's Man and His Gods (52), no recent text could be found with the focus primarily on the mind-body approaches of the various indigenous people of Africa.

In conclusion it can be said that some of the cross-cultural perspectives just discussed would in the First World of today surely be seen as psychopathology. There are, however, similarities to be found between the cross-cultural views and some of the historical Western perspectives - even to some of the perspectives currently adhered to. Although the mind-body approaches of the school of psychoanalysis were, but for Freud, not touched upon in the section that dealt with the historical perspectives, there would

appear to be an eerie resemblance between some of the cross-cultural views and certain concepts from the school of psychoanalysis. It would be foolish to summarily denounce these cross-cultural views as inferior to that of the First World as many analogies may be found when analysed in context of their respective social environments.

1.3 Current views on the mind-body relationship

The majority of First World Westerners would appear to adhere to some kind of monistic view of the mind-body relationship, but variations on the dualistic approach, as well as a variety of compromises between the two exist. In addition various cross-cultural perspectives are still alive and well and, as previously mentioned, more attention is currently being paid in the West to mind-body approaches and practices based on Eastern philosophies.

The dualistic approach is still vigorously adhered to by those considering the differences between the brain and the behavioural processes as irreconcilable. Although most present day dualists accepts the reality of an interaction between mind and body, no feasible interactive pathway could yet be offered in explanation for the link between the material body and the presumed immaterial mind. Some vague, rather unsatisfactory, explanations were put forward by Karl R Popper, 1977 (53) and John C. Eccles, 1989 (54). Another form of dualism is found among many individuals from diverse religious persuasions, i.e., occasionalism where the mind and body is seen as separate and independent, but correlated by the intervention of God.

The monistic approach can rightfully be seen as the major academic concept of the day - at least where the First World is concerned. The majority of current day monists are materialists, believing that the processes of the mind are of material origin, inseparable from the brain and subject to the same physicochemical laws as everything else. Two other forms of monism are, however still adhered to by smaller groups, i.e., subjective idealism, which proclaims a single underlying mental reality to mind and body, and phenomenalism, which proclaims that neither mind nor body exists – only impressions.

Over the past 50 years empirical scientists from various disciplines had significant success in identifying the so-called mechanisms underlying the processes generally seen as mind (55,56,57,58,59). The empirical research activities of these scientists, often from diverse disciplines, have come to be known as the *analytical philosophy of the mind.* In this school of thought it is accepted that no mind exists without the physical brain and the only problem that remains is to identify the exact underlying processes.

In the quest to define materialistic-monism in terms of evolution the Darwinian evolutionary theory evolved into the post-Darwinian theory where the properties of the mind are seen as the evolutionary development of ever more complex neural networks. Developments in the post-Darwinian evolutionary theory lead to the concept of *emergence*, a term referring to the identification or emergence of previously unknown characteristics of, amongst others, the brain. Several variations exist on the *emergence* monistic approach with one of the more reductionistic-materialistic variations found in the *identity hypothesis* (60). The identity hypothesis sees mind and brain as one – a kind of function-structure relationship - interpreted by some as the elimination of mind (61). The reductionistic materialistic version of the monistic approach left us with the problem of the *freedom of will* and the question of *determinism.* The determinants of *the freedom of will and action* is at this period in time still passionately debated and approaches vary from a) the purely neurophysiological view of Kornhuber, 1978 (62), where mind is reduced to the flow of information through the nervous system, to b) the *logical relativity principle* of MacKay, which virtually denies the existence of free action (63), to c) the evolution-based concept of Searle, 1984 (64), that claims evolution to have provided mankind with conscious, voluntary and intentional behaviour, to d) approaches based on pure physics like the holographic paradigm proposed by Pribram and Bohm, 1991 (65), and the so-called computer paradigm described by Beckerman, 1990 (66), based on the argument that even non-living physical systems such as computers can come to logical conclusions, and to e) sub-molecular level arguments and quantum physics to f) multidimensional perspectives, such as that of Halstedt, 1988 (58), that proposes the mind to be part of nature which, in line with the emergence theory, has acquired the ability to think and to reflect. An outflow from the sub-molecular search into the meaning

of mind is the return to another form of monism, i.e., subjective idealism – although not presently referred to as such. It is said that elementary particle physics has become so abstract that its objectivity is disappearing – leaving the concept of matter and the principle of causality disputable (61). Based on this the mind is suggested to be the deepest sense of reality from which the body emerges in some or other way (67). The natural sciences, in moving into this abstract sub-molecular level of elementary particle physics, finds itself in the same dilemma as that of the humanities where the safe foundation of empirical evidence becomes extremely elusive.

One can perhaps summarise by saying that the materialistic version of the monistic approach to the mind-body dilemma is the view of the day but that many questions still bewilder us, not least the question of free will and determination. However, the study of consciousness remains a stumbling block as no general agreement can be reached on the meaning of this concept. To quote Miller, 2000 (68):

Classical science, alternative and complementary healing, quantum physics, and metaphysics all take drastic different approaches to consciousness research. A bridge is needed to restore the conceptual unity of mind-body. However the construction of such a bridge paradoxically must rely on consciousness for information. The construction company (Consciousness, Inc.) therefore becomes means and end in the design of the bridge.

Miller, 2000 (68).

In *Journey to the Centers of the Mind* by Greenfield, 1995 (69) the author attempts to unify many of the apparently incompatible theories of consciousness ranging, from phenomenological perceptions to physical neural events, into a concentric theory of consciousness. Miller (68), five years later, would not appear to have read the work. In this lies another problem in the progression of our understanding, i.e., the lack of interdisciplinary efforts and communication – ironically referred to by Miller himself.

In accepting reductionistic-monism to be the approach of the day one should, however, emphasize that this view is not without opposition – not even within the usually materialistic-monism encountered in the field of medicine. An interesting point of view, coming specifically from a department of internal medicine (70), and based on the fourth century writings of Gregory of Nyssa (71), recently appeared in *Perspectives in Biology and Medicine*, urging physicians not to fall into the traps of reductionism or idealism. It should in summary be stressed that certain contemporary approaches, currently being grouped under materialistic-monistic, strongly resemble compromises. In addition, various interdisciplinary attempts in search of a model that unifies the concepts from the major prevailing schools of thought are presently in progress. It would, however, appear that the majority of scientist, from both the natural sciences and the humanities, accept the integration of mind and body without questioning the definitive relationship.

Over the last two decades the so-called post-modern perspectives on mind-body unity have become objects of intense scientific research. Among these psychoneuroimmunology (PNI) is considered by many as one of the most important recent developments involved in the redefinement of the mind-body relationship. Psychoneuroimmunology is, however, less interested in what is considered the mind-body problem and more in the multi-directional interactions between mind and body. This, by implication, includes past and present environmental influences. In this respect it perhaps resembles groups from the school of functionalism who accepted the interaction or unity without further ado. In psychoneuroimmunology the focus is on the practical implications of the interaction rather than on the nature of the interaction.

Psychoneuroimmunology, in short, looks at behaviour as biological response modifier and *vice versa*. The next paragraphs will briefly define psychoneuroimmunology and attempt to put it in context to other paradigms.

1.4 Introduction to Psychoneuroimmunology

Psychoneuroimmunology (PNI) is the study of the interactions between behaviour, the brain and the immune system. As the neurological system is largely in control of the endocrine system the interactions can be seen as between behaviour, brain, endocrine and immune systems. Psychoneuroimmunology is therefore sometimes also referred to as psychoneuroendocrino-immunology (PNEI). The immune system, previously seen as an independent system responding only to antigenic stimulation, is now known to be influenced by the neuroendocrine system. It is becoming more and more clear that the immune system can in turn act as neuroendocrine regulatory system. The immune system was, in fact, described by Blalock (72), as a sixth sense organ, informing the brain about peripheral events. The influence of the immune system on the brain is, however, much more than that of a sensory organ. It has, in addition, been shown to be able to alter cerebral functioning, and to induce long-term anatomical changes with subsequent behavioural effects. It speaks for it self that interactions between the behavioural functions and the two main physiological regulatory systems, i.e., the neuroendocrine and immune systems would influence the total individual – mind as well as body. Every system and function would therefore influence, and be influenced by, all others. In addition, perceptions of environmental events registered through the senses, information about inflammatory or infectious conditions carried by immunological messenger systems, and psychological events with its associated patterns of cerebral information flow, would all be able to influence, and be influenced by, the functional integrity of both body and mind.

Many devoted scientists in a variety of sub-disciplines contributed to the rapid conversion of psychoneuroimmunology from a speculative field to that of a recognised science. The idea of the psychoneuroimunological interaction being a recent concept is, however, wrong. All that is new is the name and the scientific credibility afforded to the existence of the interaction – this as a result of the intense research by accredited scientists of recent times. Written proof for earlier acceptance of this kind of mind-body interaction, or rather unity, can be found throughout the literature. In scanning the historical, the

cross-cultural, as well as more recent approaches to the mind-body problem, it is clear that the concept of a mutual influence between the psychological and physiological functions were taken for granted by most - this despite differences in their positions to the mind-body impasse. In Figure 1.1, right column, it was seen how, over a period of about 100 years, psychological studies showed that mental events such as suggestions, mesmeric trance states, trauma, catharsis, and submergence of part of the consciousness into the subconsciousness can dramatically influence the body. However, recognition of the mind's potential influence on the body existed long before the existence of psychology as a subject. Suffice to refer to the Transylvanian physician Papai Pariz Ferenc (73), said by Solomon in 1993 (74), to essentially have reiterated Aristotle and to have anticipated psychoneuroimmunology when, in 1680, he wrote:

When the parts of the body and its humors are not in harmony, then the mind is unbalanced and melancholy ensues, but on the other hand, a quiet and happy mind makes the whole body healthy.

Papai Pariz Ferenc, 1680 (73).

Although intuitive knowledge about the interactions between the psychological status and inflammatory, as well as infectious, conditions has been there for literally hundreds of years, the academic knowledge to prove this link was lacking. From an academic point of view it is obvious that psychoneuroimmunology evolved from observations that a connection exists between psychological stressful events and disease. In fact, psychoneuroimmunology can rightfully be seen as an outflow of the stress paradigm. Another trailblazer, albeit lesser investigated in terms of the underlying mechanisms, and perhaps more of a postulate than a scientific proven field, is the biopsychosocial approach. More direct empirical evidence in support of the interactions were derived from a sub-discipline of the biological sciences, i.e., neuroimmunomodulation. Although initial papers on psychoneuroimmunology were speculative (75), we have now moved beyond the point of speculation and intuitive knowledge to where the convergence of many sub-disciplines from the biological sciences and humanities lead to the emergence of its present status, i.e., an interdisciplinary field where body and mind are seen as one

functional unit. Many workers from various disciplines contributed to the development, but the names of Robert Ader[1], David L Felten[2] and Nicholas Cohen[3] (76,77,78) should be mentioned for their outstanding contributions in converting psychoneuroimmunology to a recognised scientific field.

Despite the current intense focus by some on psychoneuroimmunology, the majority of scientists, in both the humanities and in the natural and medical sciences, are still not familiar with, or even sceptical about, the field. This is largely based on ignorance as well as a blatant disregard for the obvious. A major contributing factor may be the diverse nature of the interacting academic fields, i.e., psychiatry, psychology, immunology and neuroendocrinology.

Before buying into the psychoneuroimmunological concept it would be reasonable to ask what practical examples could be found in order to corroborate the existence of the psychoneuroimmunological interaction. The answer lies in at least three major categories of evidence, i.e., a) the fact that the immune system can be conditioned to react in a specific way, b) the influence of behavioural factors and psychological interventions on the clinical course and outcome of disease processes and c) the behavioural changes which follows upon immune-associated physical disorders and upon administration of immunocompetent substances such as cytokines.

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[1] Editor-in-Chief of *Brain, Behavior, and Immunity*, editor/co-editor of all three editions of *Psychoneuroimmunology*, past president of the *American Psychosomatic Society*, the *International Society for Developmental Psychobiology* and the *Academy of Behavioral Medicine Research,* and founding member of the *Psychoneuroimmunological Society.*

[2] Past director of the *Neurosciences Graduate Program* and associate director of the *Center for Psychoneuroimmunological Research* at Rochester University, co-editor of *Psychoneuroimmunology* 2nd and 3rd editions, associate editor of *Brain, Behavior and Immunology*, and present director of the *Center for Npecteuroimmunology* at the Loma Linda University School of Medicine.

[3] Professor of *Microbiology and Immunology,* associate director for *Psychoneuroimmunological Research*, past councilor of the *Psychoneuroimmunological Research* Society and co-editor of the 2nd and 3rd edition of *Psychoneuroimmunology* .

1.5 Organisation of subsequent chapters

The aim of this thesis, as previously mentioned, is to define the psychoneuroimmunological interaction in terms of the two main stress axes. Before embarking on a description of the various intercommunications it is necessary to have empirical evidence in support of the existence of a pervasive psychoimmunological interaction and to show that this bidirectional influence has practical implications for both the psychological and physical health of the individual. The next chapter, i.e., Chapter 2, will deal with such evidence. It will also be shown that immune changes have been reported for all classes of the DSM-IV. Reference will be made to the biopsychosocial model mentioned in Chapter 1. This aspect will be returned to in Chapter 7 where it will be shown how the psychoneuroimmunological concept relates to, but also differs from the biopsychosocial model.

The subsequent three chapters will provide the necessary evidence for the bidirectional influences between the psychological, the neurological and the immunological aspects, i.e., the empirical proof for the psychoneuroimmunlogical interactions in terms of the two main stress axes. As was previously mentioned, psychoneuroimmunology is considered an extension of the stress paradigm. This becomes markedly evident when the controlled stress response is seen as a new homeostasis in which mind and body are empowered to cope with the stressor – be it physical or psychological. In fact, it will be seen that the classification of stressors into psychological and physical is artificial and only applies to the initial stimulating event as mind and body, respectively, are influenced by each other in a transactional manner. In this thesis stressors and stress are treated as integral aspects of everyday life, necessary for growth, development and adaptation – with the concept of psychopathology entering the quotation only when normal control is overpowered or negative feedback fails.

In line with the aim of the thesis Chapters 3 to 5 will present the psychoneuroimmunological interactions of the two main stress axes. Chapter 3 and 4 will deal with psychoneuroimmunology in terms of the first major stress axis, i.e., the central

noradrenergic/sympathoadrenomedullary axis. In Chapter 3 the importance of this system for the regulation of states of cognition, emotion and cerebral activity will be shown, as well as its interactions with other neuromodulatory systems that are major determinants of the psychological disposition and responses. Chapter 4 will show that these same neuromodulatory systems, so important in the psychological processes, can influence and be influenced by the immune system. Chapter 5 will deal with the psychoneuro-immunology of the second stress axis. The interactions will again be shown between the psychological and the cerebral aspects, and between the neurological and immunological functions. It will be shown that corticotropin releasing-hormone (CRH) plays a central role in the psychoneuroimmunological interaction with regard to both stress axes. This will be illustrated diagrammatically. Having demonstrated the controlling role of CRH in the psychoneuroimmunological interaction of both stress axes, Chapters 6 and 7 will, when referring to the neurohormonal aspects, focus primarily on the corticotropin-releasing hormone/hypothalamo-adrenocortical axis.

Chapter 6 will discuss mechanisms through which immunological activity can influence the neurological and therefore the psychological status – with particular emphasis on the immune influence on CRH/HPA-related behaviour. It will be shown that immunological events can act as stressors, leading to a new adaptive neuropsychological homeostasis.

Chapter 7 will present a model comprising relevant psychoneuroimmunological interactions to demonstrate the influences discussed in the rest of the thesis. A model of sickness behaviour, developed to demonstrate psychoneuroimmunology in terms of the two main stress axes, will be presented. It will be shown how psychosocial, as well as immunological events during early life can predispose to, and prolong erstwhile appropriate adaptive sickness behavioural responses and how this can lead to inappropriate, prolonged behavioural symptoms that correspond to that of psychiatric disorders.

Chapter 8 will present concise conclusions on the thesis as a whole.

In an attempt to facilitate the reading of the thesis a synopsis of each chapter is given in bold at the start of each chapter. This should be seen as an abstract of the chapter. Each chapter is again concluded by a short explanatory writing, given in bold, that connects it to the subsequent chapter. Due to the interdisciplinary nature of the work Chapter 4 and part of Chapter 5 (neuroimmunological interactions) have a very strong physiological bias. For the purpose of this writing presentation of integrated diagrams would probably have sufficed. However, such diagrams do not exist and had to be compiled from publications. These diagrams are presented at the end of each chapter. It is possible to understand the diagrams without going through the chapters - should the reader not be interested in the supporting evidence for the interactions shown in the diagrams.

This chapter presented a very brief overview of the mind-body problem, first in historical context, followed by examples of cross-cultural perspectives and a discussion of the more recent developments in the field. The major current perspective appears to be materialistic-monistic, which confronts us with several problems, not least the question of free will and determination. Psychoneuroimmunology, as so-called post-modern perspective on the mind-body relatedness, is defined and it is shown that its implications for mind and body were long intuitively suspected. The chapter is concluded with the rationale and layout of the rest of the thesis. The next chapter will show the pervasive bidirectional influence between the behavioural functions and the first of the two main stress axes, i.e., the central noradrenergic/peripheral sympathoadrenomedullary axis.

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Appendix

From the catalogue of the exhibit of books from the collections of the National Library of Medicine held in honour of the Centennial Celebration of the American Psychological Association.

1. Descartes, René (1596-1650) *Renatus Des Cartes de homine, figuris, et latinitate donatus a Florentio Schuyl* ... Lugduni Batavorum, apud Petrum Leffen & Franciscum Moyardum, 1662. 18 p.l.,121(i.e., 123),[1] p. illus. plates. 21 cm. [Written in 1633, suppressed, and unpublished before 1662.]

   ENGLISH: *Treatise of Man[.]* [By] René Descartes[.] French text with translation and commentary by Thomas Steele Hall[.] Harvard University Press[,] Cambridge, Massachusetts[,] 1972[.] xlviii, [2],232 p. illus. 24 cm.

2. Descartes, René (1596-1650) *Renati Des Cartes[,] meditationes de prima philosophia, in quibus Dei existentia, & animae à corpore distinctio, demonstratur* ... Tertia editio prioribus auctior & emendatior ... Amstelodami, Apud Ludovicum Elzevirium. 1650. 6 p.l.,191,[1] p. 20 cm. [Published with an:] Appendix, continens obiectiones quintas & septimas in Renati Des-cartes meditationes de primâ philosophia, ... altera ad celeberrimum virum D. Gisbertum Voetium ... [with a special titlepage] Amstelodami, Apud Ludovicum Elzevirium, M.DC.XL.IX [1649], [and separate paging,] 164 p. [and:] Epistola Renati Des Cartes ad celeberrimum virum D. Gisbertum Voetium ... [with a special half-title and separate paging,] 88 p. [First published as: Renati Des-Cartes, meditationes de prima philosophia, in qua Dei existentia et animae immortalitas demonstratur. Parisiis, Apud Michaelem Soly, 1641.]

ENGLISH: *Six Metaphysical Meditations; Wherein it is Proved That There is a God. And That Man's Mind is Really Distinct from His Body.* Written originally in Latin by Renatus Des-cartes. Hereunto are added the objections made against these meditations. By Thomas Hobbes of Malmsbury. With the authors answers. All faithfully translated into English, with a short account of Des-cartes's Life. By William Molyneux ... London: Printed by B.G. for Benj. Tooke ... 1680. 8 p.l.,160 p. 17 1/2 cm.

3. Descartes, René (1596-1650) *Les passions de l'ame.* Par René Des Cartes. A Paris, Chez Henry LeGras ... M.DC.XL.IX ... [1649.] 24 p.l.,286 p. 16 1/2 cm.

ENGLISH: *The Passions of the Soule in Three Books. The First, Treating of the Passions in Generall, and Occasionally of the Whole Nature of Man. The Second, of the Number, and Order of the Passions, and the Explication of the Six Primitive Ones. The Third, of Particular Passions.* By R. des Cartes. And translated out of French into English. London, Printed for A.C. and are to be sold by J. Martin, and J. Ridley ... 1650. 15 p.l.,173 p. 14cm.

4. Malebranche, Nicolas (1638-1715) *Father Malebranche's Treatise Concerning The Search after Truth. The Whole Work Compleat. To which is Added The Author's Treatise of Nature, and Grace. Being A Consequence of the Principles Contain'd in the Search: Together with His Answer to the Animadversions upon the First Volume: His Defense against the Accusations of Mr. De la Ville, etc. Relating to the same Subject.* All translated by T. Taylor, M.A. ... Oxford, Printed by L. Lichfield, for Thomas Bennet Bookseller, ... London. M.DC.XCIV. [1694]. 6 p.l.,172(i.e.,176),[4],10,203,[1],42 p. diagrams. 33 1/2 cm. [First published in French as De la recherche de la vérité, o□ l'on traitte de la nature de l'esprit de l'homme, & de l'usage qu'il en doit faire pour éviter l'erreur dans les sciences. Ã Paris, Chez André Pralard, 1674-1675. 2 vols.]

5. Spinoza, Benedictus de [Spinoza, Baruch] (1632-1677) *B. d. S. Opera posthuma, quorum series post praefationem exhibetur.* ... M.DC.LXXVII. [Amstelodami, J. Rieuwertsz, 1677.] 20 p.l.,614,[34],112,[8] p. diagrams. 21 1/2 x 17 cm.

ENGLISH: *Benedict de Spinoza; His Life, Correspondence, and Ethics*. By R. Willis, M.D. ... London: Trübner & Co., ... 1870. xliv,[2],647,[1] p. 23 cm.

6. La Mettrie, Julien Offray de (1709-1751) *L'homme machine* ... Ã Leyde, De l'Imp. d'Elie Luzac, Fils, MDCCXLVIII. [1748]. 10 p.l.,109,[1] p. 14 1/2 cm.
[There are three French editions of 1748. The "W' edition has 108 pages and is exceptionally rare. The "X" edition has 109 pages with errors of "W" corrected; it is the standard edition. The "Y' edition has 148 pages, with additional corrections possibly by La Mettrie, but is possibly a pirated edition.]

ENGLISH: Man a Machine. Translated from the French of the Marquiss D'Argens. London: Printed for W. Owen, 1749. 87 p.12mo.

7. Cabanis, Pierre Jean Georges (1757-1808) *Rapports du physique et du moral de l'homme*, par P.J.G. Cabanis ... De l'imprimerie de Crapelet. A Paris, Chez

Crapart, Caille et Ravier, ... an X -- 1802. 2 vols. xliv,484; [4],624 p. 20 cm. [Portions of the Rapports first appeared in the Mèmoires des sciences et arts: sciences morales et politiques. Paris ... Baudouin, imprimeur de l'Institut national, 1798,1799,1801,1803.]

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10. Lewes, George Henry (1817-1878) *The Physical Basis of Mind. With Illustrations. Being the Second Series of Problems of Life and Mind.* By George Henry Lewes. London: Trübner & Co., ...1877. xiv,[2],493,[3] p. illus. 23 cm.

11. Prince, Morton (1854-1929) *The Nature of Mind and Human Automatism.* By Morton Prince, M.D., ...Philadelphia: J.B. Lippincott Company. ...1885. x,173,[1] p. 20 cm.

12. Gall, Franz Josef (1758-1828) and Spurzheim, Johann Gaspar [Spurzheim, Johann Kaspar; Spurzheim, Johann Christoph] (1776- 1832) *Anatomie et physiologie du système nerveux en général, et du cerveau en particulier, avec des observations sur la possibilité de reconnoître plusieurs dispositions intellectuelles et morales de l'homme et des animaux, par la configuration de leurs têtes;* par F.J. Gall et G. Spurzheim. Premier -- [quatrième] volume ... Paris, F. Schoell, ... 1810-1819. 4 vols. + atlas. 2 p.l.,lix,[1],352; 2 p.l.,466,[2]; 4 p.l.,xxxiii,[1],372; 3 p.l.,404 p.; atlas: 1 p.l., 100 plates (1fold). 31 cm., atlas: 55 cm.

13. Flourens, Marie-Jean-Pierre (1794-1867) Recherches expérimentales sur les propriétés et les fonctions du système nerveux, dans les animaux vertébrés; par P. Flourens. A Paris, Chez Crevot[,] ... 1824. 2 p.l.,xxvi,331,[3] p. 20 cm.

ENGLISH: Flourens, Pierre. Investigations of the properties and the functions of the various parts which compose the cerebral mass. [Pp. 85-122]. In: *Some Papers on the Cerebral Cortex[.]* Translated from the French and German by Gerhardt von Bonin[.] ... Charles C. Thomas ... Publisher[,] Springfield, Illinois ... [1960.] Pp. 3-21.

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The Emotions and the Will. By Alexander Bain ... London: John W. Parker and Son ... 1859. xxviii,649,[1] p. 22 ½ cm.

15. Spencer, Herbert (1820-1903) *The Principles of Psychology.* By Herbert Spencer ... London: Longman, Brown, Green, and Longmans. 1855. viii,620 p. 22 cm.

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ENGLISH: Broca, Paul. Remarks on the seat of the faculty of articulate language, followed by an observation of aphemia. In: *Some Papers on the Cerebral Cortex[.]* Translated from the French and German by Gerhardt von Bonin[.] ... Charles C. Thomas ... Publisher[,] Springfield, Illinois ... [1960.] Pp. 49-72.

17. Jackson, John Hughlings (1835-1911) *Clinical and Physiological Researches on the Nervous System. (Reprints.) No. 1. -- On the Localisation of Movements in the Brain.* By J. Hughlings Jackson, ... [Reprinted from the "Lancet," 1873.] J. and A. Churchill ... [1875.] 2 p.l.,xlviii,37,[1] p. 21 1/2 cm.

18. Ferrier, David (1843-1928) *The Functions of the Brain[.]* By David Ferrier, ... London[,] Smith, Elder, & Co., ... 1876[.] xv,[1],323,[1] p. 22 cm.

19. Mesmer, Franz Anton (1734-1815) *Mémoire sur la découverte du magnétisme animal;* par M. Mesmer, ... A Geneve; Et se trouve A Paris, Chez P. Fr. Didot le jeune, Libraire-Imprimeur de Monsieur, ... M.DCC.LXXIX. [1779]. 2 p. l.,vi,85,[3] p. 17 cm.

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21. Braid, James (ca.1795-1860) *Neurypnology; or, the Rationale of Nervous Sleep, Considered in Relation with Animal Magnetism. Illustrated by Numerous Cases of Its Successful Application in the Relief and Cure of Disease.* By James Braid, ... London: John Churchill, ... Adam & Charles Black, Edinburgh. 1843. xxii,265,[1] p. 17 1/2 cm.

22. Liébeault, Ambroise Auguste (1823-1904) *Du sommeil et des états analogues considérés surtout au point de vue de l'action du moral sur le physique[,]* par A.-A. Liébeault ... Paris[,] Victor Masson et fils ... ; Nancy[,] Nicolas Grosjean, ... 1866[.] 535,[1] p. 22 cm.

23. Charcot, Jean-Martin (1825-1893) *Leçons sur les maladies du système nerveux faites à la Salpétriere[.]* Par J.-M. Charcot ... Recueillies et publiées par [Desiré Maglivre] Bourneville[.] ... Paris[:] Adrien Delahaye, Libraire-Éditeur[,] 1872- 1873. [vi],368 p., plates. 22 1/2 cm. [Originally issued in 4 parts, paginated as: [iv],96; 97-192, 193-256, [viii],257-368 p. A second volume, also in 4 parts, was issued between 1873 and 1877; and a third volume appeared in 1883 under the editorship of Babinski, Bernard, Féré, Guinon, Marie et Gilles de la Tourette].

ENGLISH: *Lectures on the Diseases of the Nervous System. Delivered at La Salpétrière,* by J.M. Charcot, ... Translated by George Sigerson, M.D., ... London: The New Sydenham Society. MDCCCLXXVII [1877.] xiii,[3],325,[1] p., plates, 22 1/2 cm. [The second and third volumes appeared in translation in 1881 and 1889.]

24. Bernheim, Hippolyte (1840-1919) *De la suggestion dans l'état hypnotique et dans l'état de veille[.]* par Le Dr. Bernheim ... Paris[,] Octave Doin, ... 1884[.] 110 p. 24 1/2 cm.

ENGLISH: *Suggestive Therapeutics[.] A Treatise on the Nature and Uses of Hypnotism[.]* By H. Bernheim, M.D. ... Translated from the second and revised French edition by Christian A. Herter, M.D. ... New York & London[,] G.P. Putnam's Sons ... 1889[.] xvi,420 p. diagrs., facsims. 23 1/2 cm.

25. Janet, Pierre-Marie-Félix (1859-1947) *L'automatisme psychologique[;] essai de psychologie expérimentale sur les formes inférieures de l'activité humaine[,]* par Pierre Janet ... Paris[,] Ancienne Librairie Germer Baillière et Cie[,] Félix Alcan, Éditeur ... 1889[.] 4 p.l.,496 p. diagrs. 22 cm.

26. Breuer, Josef (1842-1925) and Freud, Sigmund (1856-1939) Ueber den psychischen Mechanismus hysterische Phänomene. (Vorläufige mittheilung.) Von Dr. Josef Breuer und Dr. Sigm. Freud ... *Neurologische Centralblatt,* 1893, 12te jahrgang [Leipzig: Verlag von Veit & Comp.], 4-10, 43-47.

ENGLISH: ... *Studies in Hysteria,* by Dr. Joseph Breuer and Dr. Sigmund Freud; authorized translation with an introduction by A.A. Brill ... New York and Washington, Nervous and Mental Disease Publishing Company, 1936. ix,241 p. 23 1/2 cm. [Nervous and Mental Disease Monograph Series. No. 61 -- a translation of Studien über Hysterie von Dr. Jos. Breuer und Dr. Sigm. Freud[.] Leipzig und Wien. Franz Deuticke 1895, which supplemented the original paper with additional material].