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4. Thomas A. Ban: The Birth of a Medical Discipline: Psychiatry*

Table of Contents

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From William Cullen's "neuroses" to Johann Christian Reil's "psychiaterie"

Madness may be as old as mankind (Porter 2002). Yet, development of the discipline dedicated to study and treat "madness," that was to be referred to as "psychiatry," began only in the late 18th century. Instrumental to this development was William Cullen (1712-1790), a professor of medicine and physics at the University of Edinburgh, in Scotland.

Stimulated by the research of Boissier de Sauvages (1706-1767) at the University of Montpellier, in France, who described and classified diseases as botanists describe and classify plants (Sauvages 1768), Cullen (1769, 1777), classified diseases into four classes (pyrexias, neuroses, cachexias and locales), with as many as 19 orders and 132 genera (Doig, Ferguson, Milne and Passmore 1993).

Cullen (1772), defined disease as an excess or deficiency of "sensibilities" in his *Synopsis Nosologiae Methodicae* and in his treatise published in 1777 with the title "First Lines of Practice

of Physic" he introduced the term "neuroses" for a class of disease he believed were diseases of the "nerves." In the same treatise he characterized the "neuroses" by "injury of sense and motion without idiopathic pyrexia or any other local affection." Furthermore, he divided the "neuroses" into four "orders" of disease: "comate," characterized by "diminution of voluntary motion with sleep or deprivation of senses"; "adinamiae," characterized by diminution of involuntary motions whether vital or natural; "spasmi," characterized by "irregular motions of the muscles or muscle fibres"; and "vesaniae," characterized by disorders of judgment without pyrexia or coma" (Littre 1877).

In Cullen's (1777)) classification, the term "vesaniae" corresponds with "madness" and the "order" of "vesaniae" includes four "genus" of disease: "amentia," characterized by "imbecility of judgment, by which people do not perceive, or do not remember the relation of things"; "melancholia," characterized by "partial madness" that varies "according to the different subjects concerning which the person raves"; "mania," characterized by "universal madness"; and "oneroidynia," characterized by "violent and troublesome imagination in time of sleep."

Furthermore, Cullen (1777) also recognized that each form (genus) of disease might become manifest in several sub-forms ("species") of illness. There were three subforms of "amentia" ("congenita," "senilis" and "acqiusita"); eight of "melancholia" (1. "imagination concerning body being in a dangerous condition or that their affairs are in a desperate state"; 2. "imagination concerning a prosperous state of affairs"; 3. "violent love without satyriasis or nymphomania"; 4. "superstitious fear of a future state"; 5 "aversion from motion and all the offices of life"; 6. "restlessness and impatience"; 7. "weariness of life"; and 8. "deception concerning the nature of the patient's species"); four of "mania ("idiopathic," "mentalis," "corpora" and "obscura"); and three of "oneirodynia" ("paraphrosyne a veneris," "pathemata" and "febrilis") (Menninger, Mayman and Pruyser 1968).

Cullen's (1777) separation of "universal" (total) from "partial" madness on the basis of "totality" of mental pathology was to dominate classifications of insanity in the 19th century from Philippe Pinel's (1798) and Jean-Étienne Dominique Esquirol's (1838) in France, who distinguished between "mania" (universal insanity) and the "monomanias" (partial insanities), to Karl Kahlbaum's (1863) in Germany, who distinguished between the "vesanias" (total-universal insanities) and the "vecordias" (partial insanities).

Cullen's (1777) classification attracted attention in Continental Europe and the United States. Hence, his classifying "madness" as diseases of the "nerves" could not be dismissed by the "mentalists" (referred to by some as "German Romanticists"), a powerful group of physicians at the time who believed that "insanity" was an affliction of the "mind" (Pichot 1983; Shorter 2005). To shift emphasis from the nerves (brain) to the mind (psyche) in the understanding of "madness," the term "Psychiaterie" was introduced in 1808 by Johann Christian Reil, a professor of medicine in Halle, Germany, the same year John Dalton introduced his "atomic theory" in Part II of his treatise on New System of Chemical Philosophy, in London.

The term, "Psychaterie" was replaced by the term "Psychiatrie" by Reil himself and the term "Psychiatrie" was adopted by Johann Christian Heinroth, a professor of medicine in Leipzig (Germany). It was through Heinroth's influential *Textbook on the Disturbances of Psychic Life*, published in 1818, that the term "psychiatry" spread around the world (Pichot 1983).

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Classifications of insanity in the late 18th and early 19th century

William Cullen's (1777) classification of the *vesaniae* had a major impact on classifications of "insanity" during the 19th century. His separation of "partial madness" from "universal madness" has remained one of the organizing principles of psychiatric nosology to date.

In the early 19th century several classifications of "madness" were advanced. Most of these classifications shared some common features with Cullen's (1777). In this "vignette," the essential features of three classifications from the period, Vincenzo Chiarugi's (1793-4), Philippe Pinel's (1798, 1801) and Johann Christian August Heinroth's (1818) are be presented.

Vincenzo Chiarugi (1759-1820), was an Italian physician whose name in psychiatric history has become associated with the "outlawing of chains" for restraining patients (Morra 1959). It was Chiarugi's (1793-4) influence that, in 1789, the Regulations of the Royal Hospital of Santa Maria Nuova in Florence, "forbade brutality towards patients" and "described hygienic measures to be applied by the nursing staff under medical supervision" (Pichot 1983).

Chiarugi adopted Cullen's (1777) classification with some minor modifications. Thus, in his treatise, *Della Pazzia in Genere e Specie* (Insanity and Its Classification), published in 1793-4, he recognized three classes of "madness": "melancholia," "mania" and "amentia," with several

sub-forms. He characterized “melancholia” by ”partial distortion of reality with regard to one or a few ideas”; “mania” by “general insanity with violence and impetuous actions, disconnected speech, disorganized sequence of ideas, poor judgement and abnormal actions;” and “amentia” by “general insanity with deficiency of both intelligence and volition” but “without emotional manifestations.” Furthermore, Chiarugi distinguished among three sub-forms of “melancholia”: “true melancholia,” characterized by “constant depression of spirit, restlessness and impatience”; “false melancholia,” characterized by “happiness or elation due to erroneous ideas”; and “violent melancholia,” characterized by “hatred directed against self or others.” He also recognized three stages of “mania”: the first, characterized by ”agitation and shamelessness”; the second, by “violent impulses”; and the third by ”remission” and separated “congenital amentia” from ”acquired amentia” (Menninger, Mayman and Pruyser 1968).

Philippe Pinel (1745-1826)was a French physician, whose name (similar to Chiarugi’s but probably with a much wider recognition) has become associated with the “humanization of treatment of the insane” in psychiatric history. Pinel studied medicine at Toulouse, then at Montpelier where he became familiar with the research of Boissier de Sauvages’ (1768) that stimulated Cullen (1772) to develop his classification of diseases. As a translator of Cullen’s (1777) “First Line on the Practice of Physics” from the English original into French, he was also thoroughly familiar with Cullen’s classification (Pichot 1983). In 1786 Pinel became a “staff physician” at “Maison Belhomme” a private home for wealthy mental patients. In 1993 he was appointed chief physician of Bicetre hospice, a large facility for men in need of care with a psychiatric division, and in 1995 of Salpetriere, a similar facility to Bicetre for men, where he stayed for the rest of his life (Pichot 1983; Shorter 2005).

Pinel’s first classification of insanity was published, in 1798, in his *Nosographie Philosophique* and the final one, in 1801, in his *Traité Médico-Philosophique sur l’ Aliénation Mentale ou la Manie*. It was an empirical classification based on "observable facts without mixing metaphysical discussions or certain disquisitions of the ideologists” in which, by "meticulous description of the appearance of objects," mental derangements were "distributed" into five different “species." Although Pinel (1798) was critical of the classification of both Boissier de Sauvages (1768) and of Cullen (1777), the roots of his classification were in Cullen’s three “genus”

of *vesaniae* with the separation of "partial madness" from "universal madness" and both from "amentia."

The first species of "mental derangement" in Pinel's classification was "melancholia or delirium (delusions) on one subject exclusively." It was characterized by a syndrome in which "the powers of perception and imagination were frequently disturbed without any excitement of the passions." Other features included "taciturnity, thoughtful passive air, gloomy suspiciousness and love of solitude." The second species was "mania without delirium (delusions)." It was characterized by a syndrome in which "the functions of the understanding were often perfectly sound, while the patient was driven by his passions to acts of turbulence and outrage…" The third was "mania with delirium (delusions). It was manifested in "periodical delirium (delusions) united by extravagance and fury." The fourthwas"dementia or the abolition of thinking faculty" that was characterized by "mental disorganisation, where the ideas and internal emotions appear to have no connection with the impressions of sense, and to succeed each other without order, and to vanish without leaving any traces of their existence." The fifth was "idiotism or obliteration of intellectual faculties" that was characterized by "total obliteration of the thinking faculties or a privatization more or less absolute of all ideas and emotions."

Johann Christian August Heinroth (1723 -1843) was a German physician who studied theology before entering medicine. Heinroth's *Lehrbuch der Storungen des Seelenlebens* (Textbook of the Disturbances of Psychic Life) published in 1818, was instrumental for earning Johann Christian Reil's 1808 term "Psychiatry" wide acceptance. It was also in this text that Heinroth coined and introduced the term "psychosomatic medicine." For him, "insanity was by "nature a loss of liberty and the result of sin and misdeeds" (Steinberg 2004). Yet, in his monograph, *System der psychisch-gerichtlichen Medizin*, published in1825, he addressed legal aspects of "insanity." Heinroth's career culminated in 1927 with his appointment as professor of "physical medicine" at the University of Leipzig.

In Heinroth's classification, concepts from Thomas Reid's (1785) "faculties of the mind" (such as "intellect," "emotion" and "volition") were combined with William Cullen's (1777) terminology (such as "orders," "genera" and "species" adopted from botany, and integrated with generally recognized "psychic processes," such as "exaltation" and "depression"). On the basis of these considerations, Heinroth (1818) recognized three "orders" ("exaltation," "depression" and

"mixed excitation and depression"), nine "genera" and 36 "species" of "insanity." The nine "genera" in Heinroth's (1818) classification are: *Verrücktheit* (paranoia), in which "exaltation" becomes manifest in pathology of "intellect" (cognition); *Wahnsinn* ("insanity"), in which "exaltation" becomes manifest in pathology of "emotions"; *manie,*" in which "exaltation" becomes manifest in the pathology of "volition"; *Blödsinn* ("dementia"), in which "depression" becomes manifest in the pathology of "intellect" ("cognition"); *melancholia*, in which depression becomes manifest in the pathology of "emotions"; *Willenlosigkeit* ("abulia"), in which "depression" becomes manifest in the pathology of "volition"; *Verwirtheit* (mental confusion), in which a mixed order of "exaltation" and "depression" becomes manifest in the pathology of "intellect" ("cognition"); *Wahnsinnige Melancholie* (delusional melancholia), in which a mixed order of "exaltation| and "depression" becomes manifest in the pathology of "emotions"; and *Scheue* (fright), in which the mixed pathology of "exaltation" and "depression" becomes manifest in "volition."

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Bayle's discovery and the re-evaluation of the concept of dementia

In the third edition of Stedman's Medical Dictionary, published in 1990, the term "dementia" was defined as "a generalized mental deterioration due to organic or psychological factors; characterized by disorientation, impaired memory, judgement and intellect, and a shallow labile affect" (Stedman 1990). In the current (2017) Merrion-Webster on-line dictionary it is defined "a usually progressive condition (such as Alzheimer's disease) marked by the development of multiple cognitive deficits (such as memory impairment, aphasia) and the inability to plan and initiate complex behavior."

Personality changes are frequently the first warning signals of a dementing process. Yet, the term "dementia" should be used only for personality changes when intellectual deterioration is present or can be confidently predicted at a later stage (Ban 1980; Slater and Roth 1969).

The origin of the term, "dementia," is in the Latin word "demens," i.e., out of one's mind. It first appeared in the Third Book of De Medicina of Aurelius Cornelius Celsus (c. 25 BC – c. 50

AC). He used the term to describe the disorder which may follow fever-induced transient "delirium" (Ban 1991; Berrios 1981).

Celsus' recognition that not all cases of "delirium" were followed by "insanity," but only those in which a continuous "dementia" begins, set the stage for a development which culminated in the distinction between "chronic organic (neuropsychiatric) diseases," dominated by "dementia," and "acute organic (exogenous) psychiatric states, "dominated by "delirium" (Ban 1991).

The term "dementia" was dormant for centuries. It reappeared, at the turn of the 19th century, as the fourth class ("species") of "mental derangement" in Philippe Pinel's classification of "insanity" (See Bulletin 7). Pinel defined "dementia" as an "abolition of the thinking faculty" and characterized it by mental disorganization "where the ideas and internal emotions appear to have no connection with the impressions of sense, and to succeed each other without order and to vanish without leaving any traces of their existence." He also distinguished "dementia" from "idiotism," an "obliteration of intellectual faculties," characterized by "privation more or less absolute of all ideas and emotions" (Pinel 1798, 1801).

*Pinel's concept of "dementia" was adopted virtually unchanged as the fourth class of "general form of insanity" in J*ean-Étienne Dominique Esquirol's (1772–1840), classification. Esquirol emphasized that patients with dementia "utter folly because their organs of thought have lost their energy and the strength requisite to fulfill their function" and noted that most patients classified as having "dementia" were afflicted with "paralysis." He perceived the "paralysis" as a "complication" of "dementia" (Ban and Ucha Udabe 1995; Esquirol 1838; Pierce 2012; Shorter 2015; Szapiro 1975).

Instrumental to the development of our current concept of "dementia" was the discovery of *Antoine Laurent Jessé Bayle* (1799–1858) that "insanity sometimes was the symptom of chronic inflammation of the arachnoid." Bayle, a French physician, became involved in research for preparing his dissertation in which he correlated clinical manifestations with autopsy findings. In his defence of his inaugural thesis (*Recherches sur les Maladies Mentales*) on November 21, 1822 after presenting on six cases from which two had a history of syphilis, he concluded: "The symptoms of chronic arachnitis can all be reduced to a general and incomplete paralysis and to the derangement of the intellectual faculties. These two orders of phenomena proceed at an equal and

proportionate pace that allow the disease to be divided into three periods (stages)" from which the first is characterized by "mild paralysis, particularly affecting speech, and a monomania (partial insanity) with grandiose ideas," the second by "generalized mania (universal insanity) and a worsening spastic paralysis" and the third by "dementia with severe paralysis."

Between the years of 1822 and 1826, Bayle presented the results of his research in detail in three monographs. In the first, entitled "*Recherches sur L'Arachnitis Chronique Considerees Comme Cause d'Alienation*," published in 1822, he discussed his findings of chronic arachnitis in relevance to insanity. In the second, "*Nouvelle Doctrine des Maladies Mentales*," published in 1825, he focused on the grandiose delusions encountered in patients at an early stage in the development of their illness. In the third, "*Traite des Maladies du Cerveau et de ses Membranes*," published in 1826, he presented a collection of detailed case histories of 60 of his own patients. In all his publications, Baily maintained that paralysis was only one facet of a complex but distinct disorder that was secondary to a chronic inflammation of the arachnoid and included both mental and physical symptoms (Bayle 1822a,b, 1825, 1826; Pichot 1983).

On the basis of Bayle's findings Esquirol's view that paralysis was a complication of insanity was rejected. Baley's findings also upset traditional classifications of insanity by perceiving several diseases in these classifications as different stages in the development of the same disease manifest in a dementing process.

In a historical perspective, Bayle was first to separate "essential (*sui generis*) insanity," a distinct population. from "insanity," which fulfilled Giovanni Battista Morgagni's (1682 - 1771) criteria of disease, i.e., detectable changes by pathological anatomy corresponding with clinical manifestations (Morgagni 1769).

Bayle's recognition that chronic inflammation of the arachnoid lead to "dementia" stimulated research to study clinical neuropathological correlations in "insanity." In the course of this research, by the turn of the 20th century, several diseases which culminated in "dementia" with distinctive neuropathological changes were identified. Included among them are Huntington's chorea, discovered in 1872; Pick's disease identified in 1889; Binswanger's disease separated in 1894; Alzheimer's disease, described in 1907; and Creutzfeldt and Jakob's disease, recognized in 1920.

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Reflexes of the brain

In the third edition of Stedman's Medical Dictionary, published in 1950, the term "reflex" was defined "an involuntary reaction in response to a stimulus applied to the periphery and transmitted to the nervous centers in the brain or spinal cord" (Stedman 1950). In the current (2017) Merrion-Webster on-line dictionary it is defined an "automatic and often inborn response to a stimulus that typically involves a nerve impulse passing inward from a receptor to the spinal cord and then passing outward from the spinal cord to an effector (such as a muscle or gland) without reaching the level of consciousness and often without passing to the brain." The concept of a "reflex" implies a "reflex arc," i.e., a "pathway followed by nerves which carry sensory information from the receptor to the spinal cord, and then carry the response generated by the spinal cord to effector organ(s) during a "reflex."

The first description of a "reflex," that of making a person bat his eyes by aiming a mock blow of them, was given by René Descartes (1596-1650) in his treatise, *Des passions de l'ame* (Descartes 1649). In his time the action displayed in a "reflex action" was attributed to "vital spirits in the nervous fluid." It was Johann Bohn (1640-1719) who first, in 1668, recognized on the basis of his findings on decapitated frogs that the action encountered in a "reflex" was entirely "material and mechanical" (Garrison 1929).

Research to detect the structural underpinning of "reflex action," the "reflex arc," began in the laboratory of British anatomist Sir Charles Bell (1774–1842) in the early years of the 19th century. He reported his findings in 1811 in his pamphlet "New Idea of the Anatomy of the Brain and Nervous System." It reads: "On laying bare the roots of the spinal nerves I found that I could cut across the posterior fasciculus of nerves which took its origin from the posterior portion of the spinal marrow without convulsing the muscles of the back, but that, on touching the anterior fasciculus with the point of the knife, the muscles of the back were immediately convulsed." Bell's discovery that the anterior spinal roots are involved with "motor function" was in conflict with the belief of his time that "all nerves were sensory: sensible or insensible" (Bell 1811).

Bell's structural underpinning of the entire reflex arc was independently confirmed and further elaborated by French physiologist Francois Magendie (1783–1855). In 1822, Magendie demonstrated that stimulation of fibers from the dorsal root of the spinal cord caused pain and stimulation of fibers from the anterior root caused motor activity, whereas transection of fibers from the dorsal root abolished pain and transection of fibers from the anterior root abolished motor activity. His findings provided experimental proof for what was to become known as the "Bell-Magendie Law" which stipulates that the posterior (dorsal) spinal nerve roots contain only sensory fibers and the anterior roots only motor fibers. Magendie had also shown that the interaction between the roots is one directional, i.e., from the "posterior roots" to the "anterior roots" (Magendie 1822).

Magendi's findings in dog puppies were further substantiated in 1831 in rats by Johannes Peter Müller (1801-1858), a German physiologist. By severing the posterior roots of the spinal nerve leading to the frog's leg, the leg became insensible, but not paralyzed, and by cutting the anterior roots of the spinal nerve leading to the leg, the limb became paralyzed without losing sensation (Müller 1831). Two years later, in 1833, Marshall Hall (1790–1857), an English

physician and physiologist, while studying reflex function of the medulla oblongata and medulla spinalis, determined the difference between "volitional actions" and "unconscious reflexes" (Hall 1833).

Stimulated by the ongoing research in physiology in England, France and Germany on the "reflex," and especially of Magendi's (1822) recognition of the importance of the "reflex arc" that links sensory input with motor output in the functioning of the nervous system (spinal cord), Wilhelm Griesinger (1817-1878), a German physician, was first to perceive mental activity as "reflex" activity. He was also the first, in 1843, to describe "psychic reflex actions" (*psychische Reflexactionen*) (Griesinger 1843).

The first indirect-behavioral support for "psychic reflex" was given, in 1852, by Bidder and Schmidt who noted that teasing a dog with food led to gastric secretion. About the same time a similar observation was made by Claude Bernard (1817-1878). He noticed, while collecting gastric secretion from a horse, that after several repetitions the mere fact of his entering the stable provided sufficient stimulus to induce gastric secretion (Ban 1964, 1966).

By adopting the "reflex" as the elementary unit of "mental activity" in 1843, Griesinger set the stage for the development of psychiatry as a medical discipline. Twenty years later, in 1863, Ivan Mihailovich Sechenov (1829-1905), a Russian physiologist who studied "nervous inhibition" in the central nervous system of the frog in Claude Bernard's laboratory in Paris, elaborated on Griesinger's descriptions. In his monograph, "Reflexes of the Brain," he concluded that all activity, including the "psychological" in the brain, is reflex and as such follows fixed laws determinable by investigation (Sechenov 1863, 1935; Wells 1956).

The structural underpinning of the "psychic reflex" was established in the late 19th century by Italian histologist Camillo Golgi (1843-1926), who, in 1874, described multi-polar (Golgi) cells in the "olfactory bulb" with the employment of silver staining; in 1894 Santiago Ramon y Cajal (1852-1934), a Spanish histologist, established that the "neuron" is the morphological and functional unit of the nervous system; and Sir Charles Sherrington (1857-1952), an English physiologist who demonstrated that the "synapse," a term he coined in 1897, "is the functional site of transmission from one neuron to another (Cajal 1894; Golgi 1874; Pearce 2004; Sherrington 1906).

With Sherrington's demonstration that the synapse is the functional site of transmission from one neuron to another, the possibility that the "reflex arc" provides the structural basis for the functional activity of the brain has become reality and Griesinger's perception of mental activity as "reflex activity," has become a realistic possibility.

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Sechenov's re-evaluation of mental faculties and the brain

In 1669, John Locke (1632–1704), an English philosopher, published his classic, "An Essay Concerning Human Understanding" (4 books) in which he examined the foundation of human knowledge and understanding. In his treatise, Locke expressed his view that the mind at birth is a blank slate (usually referred to as *tabula rasa*) that is filled in later through experience and defined the self through a continuity of consciousness. It was also in this essay that Locke postulated the dependence of psychic activity on sense experience (Locke 1690; Wells 1959).

Ivan Mikhaylovich Sechenov **(**1829-1905) was a Russian physiologist who spent some time during his training in the laboratories of Johannes Peter Müller, in Berlin, and Claude Bernard, in Paris. Both Müller and Bernard were involved in research studying one or another aspect of "reflex activity". While in Bernard's laboratory, Sechenov was involved in research in which he succeeded in demonstrating "inhibition" of "reflex activity" (response) in frogs (Müller 1831; Sechenov 1935; Wells 1956).

In the early 1860s Sechenov went back to Paris to carry out further research to detect nervous centers which inhibit reflex movements. After completing his experiments, he wrote a treatise, "An Attempt to Establish the Physiological Basis of Psychical Processes," that was published in 1863 with the title "Reflexes of the Brain." Central to Sechenov's thesis was Locke's premise that psychic activity was dependent on sense experience (Sechenov 1863, 1935; Wells 1956).

Sechenov developed his argument about the physiological basis of psychic activity around the nature of the "reflex" by pointing out that a "reflex" has a three–phase structure. It is initiated in the first phase by a stimulus from the external or internal environment via sense receptors. It continues in the second phase by the transmission of the stimulus to the spinal cord or to the brain where connections and interconnections are made. It culminates in the transmission outward to the muscles leading to activity in the third phase. Every external activity is based exclusively on the muscles. Since the final manifestations of all psychical activity are expressed in muscular activity either by words spoken or written, or in deeds, all psychical phenomena can be explained by the activity of the nervous system and the brain. Words are a combination of sounds produced in the larynx and the cavity of the mouth by means of muscular movements (Sechenov 1935; Wells 1956).

To pursue his argument further and apply it to the concepts of "faculty psychology." Sechenov was on less solid grounds and postulated the presence of centers in the brain, the function of which were to augment or inhibit the third or muscular phase of the reflex arc. With consideration of the activity of these centers, he accounted for "emotions" in terms of an augmented muscular response and "thought" by an inhibited muscular response. In a similar manner to "emotions" and "thoughts," Sechenov attempted to account for all psychic phenomena, e.g., sensation, perception, will, wish, desire, memory, imagination (Sechenov 1935; Wells 1956)

In 1641, Rene Descartes (1596–1650), a French philosopher, published his treatise *Meditationes de Prima Philosophia* (Meditations on First Philosophy) in which he presented his doctrine on psychophysical parallelism by postulating that body and mind comprise a completely separate and materially unrelated systems which somehow run on parallel tracks (Descartes 1996). With the publication of "Reflexes of the Brain," in 1863, Sechenov challenged Descartes' doctrine.

For Sechenov, the soul, the psyche, was a function of the central nervous system in general and the brain in particular (Wells 1956).

Sechenov's contributions provide further elaboration of Wilhelm Griesinger's (1843) "psychic reflex." (See Bulletin 10). They also provide a bridge between the "psychic reflex" and Ivan Petrovich Pavlov's (1849 -1936) "conditional reflex" (Ban 1964; Griesinger 1843).

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