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This Week's Citation Classic

Melzack R & Wall P D. Pain mechanisms: a new theory. *Science* **150**:971-9, 1965. [Dept. Psychol., McGill Univ., Montreal, Canada and Dept. Biol., Massachusetts Inst. Technol., Cambridge, MA]

The theory proposes that the dorsal horn of the spinal cord acts like a gate which modulates the flow of nerve impulses from the peripheral fibers to the central nervous system. The gate is influenced by peripheral fiber activity and by descending influences from the brain. [The *Science Citation Index*® (*SCI*®) and the *Social Sciences Citation Index*® (*SSCI*®) indicate that this paper has been cited over 975 times since 1965.]

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"When we proposed the gate-control theory in 1965, we hardly expected the astonishing increase in research studies and new therapeutic approaches that was stimulated by it. Fortunately, the theory came at a time when the field was ripe for change. A small number of original thinkers had fought hard to replace the old concept of a specific pain pathway by a more dynamic conception in which pain is determined by many factors in addition to injury—by past experiences, culture, attention, and other activities in the nervous system at the time of injury. This small band of courageous people hammered away at the established, traditional theory. But despite occasional lip service to their ingenuity, the field continued unchanged, holding tenaciously on to Descartes' idea, proposed in 1664, that pain is like a bell-ringing alarm system whose sole purpose is to signal injury to the body.

"In the 1960s, a wave of new facts and ideas that had evolved gradually[1-3] was beginning to crest, and the gate-control theory rode in on the wave of the times. No one was more astounded at its success than we were. Naturally, acceptance was not immediate or total, but in spite of continuing controversy about details, the *concept* that injury-signals can be radically modified and even blocked at the earliest stages of transmission in the nervous system is now virtually universally accepted. A fortunate aspect of our publication in 1965 is the use of the phrase 'gate control.' It evokes an image that is readily understood even by those who do not grasp the complex physiological mechanisms on which the theory is based. The fact that the theory had relevance to a wide variety of fields in medicine, psychology, and biology also led to its frequent citation.

"The theory's emphasis on multiple determinants of pain has also provided a conceptual framework for the recent recognition of the complexity of clinical pain. Until the middle of this century, pain was considered primarily to be a symptom of disease or injury. We now know that chronic, severe pain is a problem in its own right that is often more debilitating and intolerable than the disease process which initiated it. The problem of pain has therefore been transformed from a mere symptom to be dealt with by the various medical specialties to a specialty in its own right which is now one of the most exciting, rapidly advancing fields of science and medicine. Happily, the main beneficiary has been the suffering person. The new concept provided the foundation and framework for a host of novel, exciting approaches to the treatment of pain. For a recent survey the reader can refer to J.J. Bonica *et al.*"[4]

1. **Melzack R, Stotler W A & Livingston W K.** Effects of discrete brainstem lesions in cats on perception of noxious stimulation. *J. Neurophysiology* **21**:353-67, 1958.
2. **Melzack R & Wall P D.** In the nature of cutaneous sensory mechanisms. *Brain* **85**:331-56, 1962.
3. **Wall P D.** Presynaptic control of impulses at the first central synapse in the cutaneous pathway. *Progr. Brain Res.* **12**:92-118, 1964.
4. **Bonica J J, Liebeskind J C & Albe-Fessard D.** *Advances in pain research and therapy.* New York: Raven Press, 1979. Vol. 3. 956 p.