

Ronald Melzack

The Puzzle of Pain

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Editorial Foreword

Pleasure and pain – however they are called – are the primary motivators of action. Though psychologists have long been occupied by the way in which varied motivating conditions – rewards, punishments, positive reinforcers, negative reinforcers, appetitive incentives, noxious incentives, etc. – influence the behaviour of animals and man, little is known about the fundamental nature of the processes of pleasure and pain to which all these motivators refer. The earlier views attributed both pleasure and pain to the types of sensory receptors that particular stimuli are capable of exciting. Thus L. T. Troland in the early 1930s attributed pleasure to the excitation of certain sensory receptors he called ‘beneceptors’, and pain to the excitation of other types of sensory receptors he called ‘nociceptors’. But the obvious flaws in such peripheral sensory theories led the search for the fundamental processes deeper and deeper into the central nervous system. This volume traces the fascinating story of the search for pain processes in the central nervous system.

Ronald Melzack brings to this task a wide experience in the neurology and psychology of pain. After extensive experimental work in several species on the neurophysiological mechanisms of pain, he has gradually moved to the study of the complex interactions of the psychological and neurological factors that give rise to the experience of pain in man. Together with P. D. Wall, he has formulated a new theory of pain, called the gate theory, which has been widely acclaimed as a major step forward in the understanding of pain processes. Already this theory has suggested approaches to the clinical treatment of patients suffering from severe and prolonged ‘intractable’ pain.

D. B.

J.S.

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Preface

The purpose of this book is to introduce both the student and the intelligent layman to the problem of pain – one of the most puzzling and challenging problems in biology and medicine. Pain is such a common experience that we rarely pause to define it in ordinary conversation. Yet no one who has worked on the problem of pain has ever been able to give it a definition which is satisfactory to all of his colleagues. Pain has obvious sensory qualities, but it also has emotional and motivational properties. It is usually caused by intense, noxious stimulation, yet it sometimes occurs spontaneously without apparent cause. It normally signals physical injury, but it sometimes fails to occur even when extensive areas of the body have been seriously injured; at other times it persists after all the injured tissues have healed and becomes a crippling problem that may require urgent, radical treatment.

There are many facets to the puzzle of pain. It has been studied in the laboratory by psychologists, physiologists, anatomists and pharmacologists. It has been examined in hospital clinics by neurologists, neurosurgeons, anaesthesiologists and specialists in internal medicine. Each of these biological or medical approaches has made a unique contribution towards understanding pain mechanisms. But the various approaches have given rise to conflicting observations and interpretations. Because every aspect of pain is the subject of vigorous debate, it is impossible to discuss pain without taking a theoretical point of view. As we shall see, a seemingly innocuous phrase such as 'pain receptors' presupposes a specific theoretical position. This book, therefore, examines the various facets of pain from a well-defined theoretical framework. The book contains two major sections. The first

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section (chapters 1-4) describes the psychological, clinical and physiological aspects of pain. The second section (chapters 5-7) examines the major theories of pain in terms of their ability to explain pain phenomena and their implications for the control of pain. The theoretical framework of the book, then, is implicit in the first section and is explicitly described in the second section. A glossary of basic medical terms is provided on p. 205.

I am grateful to many colleagues and friends who have helped guide me in my attempts to understand pain. D. O. Hebb introduced me to the problem and provided me with an exciting, new conceptual approach. W. K. Livingston led me through the subtleties and complexities of the problem, and his thinking has influenced every aspect of my subsequent work. In recent years, I have been deeply influenced and stimulated by P. D. Wall, whose research and ideas have had a powerful impact on the development of new concepts of pain; our joint explorations of new theoretical approaches and their implications are described throughout the pages of this book.

It gives me pleasure to thank Dalbir Bindra and Jane Stewart for their many excellent suggestions which have improved this book, and Mrs Jeannette Nevile for her outstanding secretarial assistance. I am also grateful to my wife Lucy and our children Laurie and Joey for their constant encouragement and support.

1 The Puzzle of Pain

Anyone who has suffered prolonged, severe pain comes to regard it as an evil, punishing affliction. Yet everyone recognizes the beneficial aspect of pain. It warns us that something biologically harmful is happening to our bodies.

Congenital insensitivity to pain

People who are born without the ability to feel pain provide convincing testimony on the value of pain (Sternbach, 1968). Many of these people sustain extensive burns, bruises and lacerations during childhood, frequently bite deep into the tongue while chewing food, and learn only with difficulty to avoid inflicting severe wounds on themselves. The failure to feel pain after a ruptured appendix, which is normally accompanied by severe abdominal pain, led to near death in one such man. Another man walked on a leg with a cracked bone until it broke completely. Children who are congenitally insensitive to pain sometimes pull out their own teeth and have on occasion even pushed their eyeballs out of their sockets (Jewesbury, 1951).

The best documented of all cases of congenital insensitivity to pain is Miss C., a young Canadian girl who was a student at McGill University in Montreal. Her father, a physician in Western Canada, was fully aware of her problem and alerted his colleagues in Montreal to examine her. The young lady was highly intelligent and seemed normal in every way except that she had never felt pain. As a child, she had bitten off the tip of her tongue while chewing food, and had suffered third-degree burns after kneeling on a hot radiator to look out of the window. When examined by a psychologist (McMurray, 1950) in the laboratory, she reported that she did not feel pain

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when noxious stimuli were presented. She felt no pain when parts of her body were subjected to strong electric shock, to hot water at temperatures that usually produce reports of burning pain, or to a prolonged ice-bath. Equally astonishing was the fact that she showed no changes in blood pressure, heart rate, or respiration when these stimuli were presented. Furthermore, she could not remember ever sneezing or coughing, the gag reflex could be elicited only with great difficulty, and corneal reflexes (to protect the eyes) were absent. A variety of other stimuli, such as inserting a stick up through the nostrils, pinching tendons, or injections of histamine under the skin – which are normally considered as forms of torture – also failed to produce pain.

Miss C. had severe medical problems. She exhibited pathological changes in her knees, hip and spine, and underwent several orthopaedic operations. Her surgeon attributed these changes to the lack of protection to joints usually given by pain sensation. She apparently failed to shift her weight when standing, to turn over in her sleep, or to avoid certain postures, which normally prevent inflammation of joints.

Miss C. died at the age of twenty-nine of massive infections that could not be brought under control. During her last month, she complained of discomfort, tenderness and pain in the left hip. The pain was relieved by analgesic tablets. There is little doubt that her inability to feel pain until the final month of her life led to the 'extensive skin and bone trauma that contributed in a direct fashion to her death' (Baxter and Olszewski, 1960, p. 381).

Spontaneous pain

In contrast to people who are incapable of feeling pain are those who suffer severe pain in the absence of any apparent stimulation. Damage of peripheral nerves in the arms or legs, by gunshot wounds or other injuries, is sometimes accompanied by excruciating pains that persist long after the tissues have healed and the nerve fibres have regenerated. These pains may occur spontaneously for no apparent reason. They have many qualities, and may be described as burning, cramping or