# PSYCHOLOGY I

## *An Experimental Approach*

*James L. McGaugh* *Richard F. Thompson* *Thomas O. Nelson*

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# Preface

We have written *Psychology I* for students taking their first course in psychology. While the book covers broad areas of psychology, it is not an encyclopedia. Rather, we have focused on what we believe are some of the most important and intriguing areas of contemporary psychology and have attempted to reveal experimental psychology as an active and a growing science. Most of what we would like to know about the causes of behavior is as yet unknown. Consequently, the science of psychology is as much concerned with asking the right questions as it is with obtaining the answers. To this end we have tried to show how questions are asked and how research provides clarification. The quest to understand the nature and causes of our human behavior is certainly one of the fascinating and fundamental endeavors in contemporary science. We have tried to present our own enthusiasm for psychology, and we hope that this book will generate enthusiasm in you, the reader.

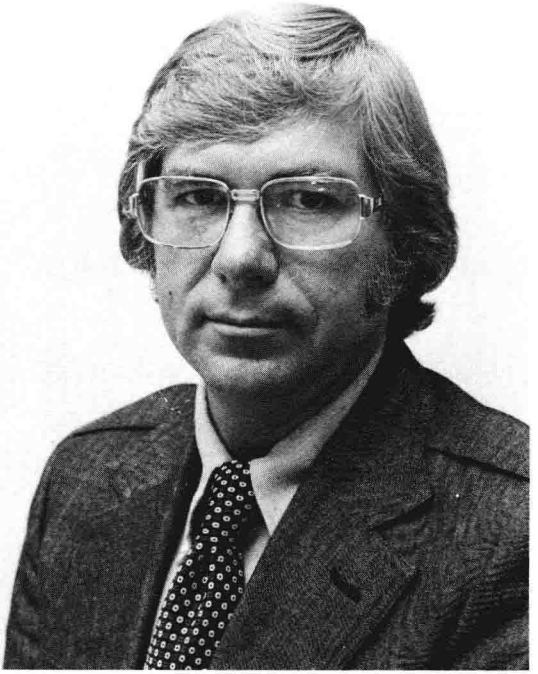
We are grateful to our colleagues for their advice and comments throughout the preparation of the manuscript for this book. We also wish to thank Dr. Sara A. Gerling for her assistance with the chapter on heredity and for proofreading many of the galleys. Thanks are due as well to Audrey Martin for her assistance with the preparation of the Bibliography and Index. We also wish to acknowledge those who permitted us to quote or reproduce material from their published works. Citations appear in the text and full publication data in the Bibliography. Finally, we thank our wives, children, and friends who tolerated, consoled, and helped during the time we worked on this book.

*James L. McGaugh*
*Richard F. Thompson*
*Thomas O. Nelson*

*October, 1976*

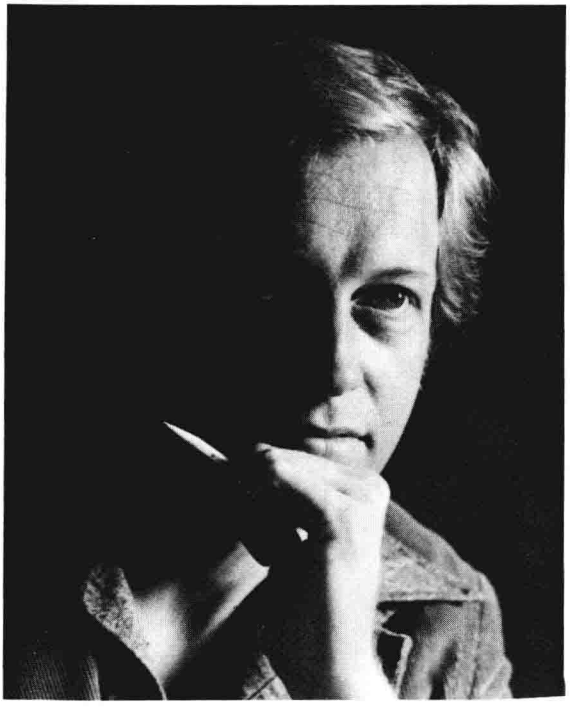
*To Becky McGaugh, Judith Thompson,*
*and the parents of Thomas Nelson*

*James L. McGaugh*



*Richard F. Thompson*

*Thomas O. Nelson*



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# Introduction

## The Scientific Study of Psychology

The scientific method is one of the most powerful ways of accumulating knowledge. Through scientific advances, radical changes have been made in the way in which people view themselves. Less than 500 years ago, people believed (1) that they consciously controlled all aspects of their behavior, (2) that they were biologically unique, fundamentally different from other species of animals, and (3) that they were at the center of the solar system, if not the center of the universe. Discoveries in various sciences have forced people to alter all three of these beliefs. Advances in astronomy, particularly those of Copernicus and Kepler, demonstrated that the earth and its inhabitants should be conceptualized as revolving around the sun, not vice versa. Next, developments in biology, notably those credited to Darwin, demonstrated that people should consider themselves as having evolved along a continuous evolutionary sequence, not as being biologically unique. Finally, developments in psychology, notably those of Freud, suggested that many aspects of behavior are due to unconscious forces, so that even the assumption of complete conscious control of one's own behavior is no longer tenable.

It is important to realize that these ideas about people not being at the center of the universe, not being biologically unique, and not being in complete conscious control of their behavior are *theories* rather than absolute truths or laws. Nevertheless, these theories have been derived

from masses of data and have proven useful for predicting numerous subsequent data (e.g., in astronomy, the data collected by Tycho Brahe formed the foundation of the heliocentric theory which, in turn, correctly predicted the discovery of the planet Pluto before Pluto was known to exist).

Science is characterized by the interplay between data and theory. Although both the scientist and the philosopher rely on theorizing, what sets the scientist apart from the philosopher is the scientist's heavy reliance upon the collection of empirical data. In the opposite direction, what sets the scientist apart from other kinds of data collectors is the scientist's eventual goal of deriving theories (e.g., stamp collectors amass large amounts of data but do not have the eventual goal of deriving theories from those data — hence, stamp collecting is not a science).

The rudiments of the scientific method are illustrated in Fig. 1-1. Through inductive logic, theories are derived from existing data, giving rise to an explanation of those data. Then, through deductive logic, predictions are made about not-yet-collected data. If, after being collected, the new data verify the predictions derived from the theory, the theory is said to be *confirmed* (i.e., our acceptance of the theory increases). Notice that a theory never is *proven* correct (i.e., our acceptance of the theory is never complete); other theories are always possible for explaining any given set of existing data. Science proceeds by pitting one theory against another and when two theories make different predictions about a particular empirical outcome the crucial experiment is conducted to determine which prediction is false, thereby disconfirming one theory while confirming the other (Platt, 1964).

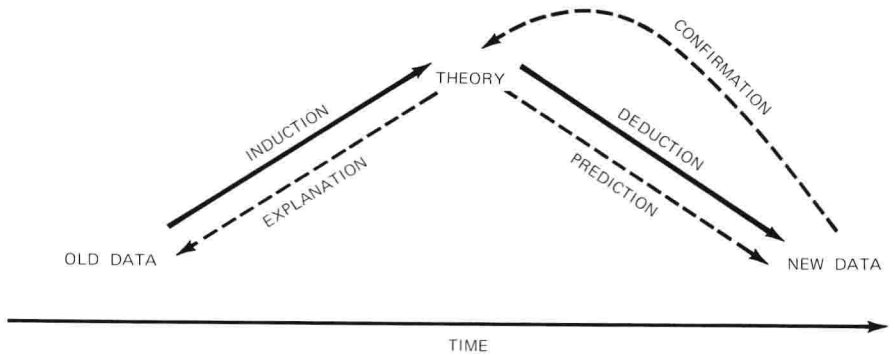


**Fig. 1-1.** Interplay between data and theory in the scientific method.

Initially, psychology was not a branch of science but, instead, was in the domain of philosophy. Psychology was considered to be the study of the soul, and later the study of the mind. Neither of these approaches was open to empirical observation and test. Gradually, however, more and

more emphasis was placed upon the study of behavior (Watson, 1913). This changing emphasis allowed for the incorporation of the scientific method because behavior (unlike the soul or the mind) is amenable to empirical observation and test. In making this change in emphasis toward behavior, psychology moved out of the realm of philosophy and into the domain of science.

## Psychology: the Science of Behavior

All behavioral acts of human beings, normal or abnormal, appear to result from a complex array of interwoven variables. There is seldom a single cause of any human act. Instead, a given behavioral occurrence usually arises from a series of many influences and causes, and no scientist or scientific technique can unravel them all.

It is a time-honored custom to use nonhuman animals as research subjects to obtain data under controlled situations as a basis for building theories of behavior. As a starting point, these often are simplified theories of human behavior.

The conquest of most human diseases attests to the advantages of studying nonhuman species; the data obtained in such studies usually generalize to humans. It is possible, for example, to study the source and course of a disease much more closely in a laboratory animal whose life is constantly regimented than in a human being, whose life is relatively nonregimentable.

In behavioral research, there are at least four reasons for using nonhuman animals as subjects. One reason is behavioral simplicity. While all animal behaviors are the result of a vast number of variables, in some animals a single variable is so dominant that it will override all others. This dominant variable can be manipulated to determine its effect on behavior.

As an example, one simple form of behavior is called a *tropism*. *Heliotropism* characterizes an animal that orients and moves toward light; the more intense the light, the stronger the movement. *Geotropism* is a response to gravity. Fetal rats, prematurely delivered at 14 days, are negatively geotropic — that is, they climb upward against the pull of gravity. At 14 fetal days, the rats cannot see and cannot hear (Crozier & Hoagland, 1934), and therefore distractions are held to a minimum. If they are placed on a wire-covered wooden surface, they climb upward; the steeper the angle of the surface, the steeper their angle of climbing. The relationship between the surface angle $\theta$ and the climbing angle $\alpha$ can be expressed by a mathematical equation such as $\theta = \log \sin \alpha$, where $\alpha$ is the climbing angle and $\theta$ is the angle of the surface to be climbed (shown in Fig. 1-2). In principle, all of our behaviors could be