

Mathematical Models of Attitude Change

**CHANGE IN SINGLE ATTITUDES
AND COGNITIVE STRUCTURE**

Volume 1

Edited by
JOHN E. HUNTER
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STANLEY H. COHEN

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Volume 1
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AND COGNITIVE STRUCTURE**

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To our families . . .

**Ronda, Tanya, and Lance Hunter
Kathy, Nathan, Eric, and Mark Danes
Judy, Adam, and Joshua Cohen**

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Preface

This volume presents a detailed and comprehensive treatment of mathematical models of attitude change. Previous work in attitude change has been devoted to verbal discussions of attitude change theories. This volume translates verbal theory to families of mathematical attitude change models. The mathematical models presented in this volume address three areas: (1) existing verbal attitude change theories which are translated into families of mathematical models; (2) attitude change theories that have been previously quantified are critiqued, and alternative mathematical models are given; and (3) new theory and corresponding mathematical models are offered.

This volume also addresses a somewhat neglected area of attitude change theory: models of source change—change in the attitude toward the source of information. For nearly every attitude change model discussed, corresponding models for change in attitude toward the source of information are also given. This volume therefore explicitly considers two types of attitude change: attitude toward the object of the message (or what is ordinarily termed attitude change) and attitude toward the source of the message (or what we have termed source change). In Part I, mathematical models of attitude change are derived from the following theories:

- Reinforcement theory
- Information processing theory
- Social judgment theory
- Balance theory
- Congruity theory
- Cognitive dissonance theory
- Cognitive consistency theory

Part II presents empirical work designed to test selected mathematical models of attitude change. Chapter 10 compares the predictions made by the following models: reinforcement, information processing, social judgment, balance, congruity, and dissonance. The results of this experiment support the information processing paradigm. Chapter 11 uses panel data obtained from survey research to compare the predictions made by reinforcement, congruity, and information processing theory. This study also supports the information processing paradigm. Chapter 12 deals with an attitude-related variable: belief and belief change. The results of two experiments designed to test four information processing models of belief change are discussed in Chapter 12. The model that gave the best fit to the data assumes that belief change is proportional to the amount of change advocated and inversely proportional to the amount of information a person has accumulated on the topic prior to the reception of a message. Chapter 13 deals with change in behavioral intentions rather than attitude change. This chapter reports on two studies that compare models derived from cognitive consistency theory with models derived from information processing theory. Once again the information processing models gave the best fit to the data.

Part III moves from the consideration of how single attitudes change to a systematic study of how many, but related, attitudes change. Related attitudes can be pictured as forming a hierarchical structure. Specific and concrete attitudinal objects may be viewed as subordinate to more general, abstract attitude objects. For example, one's attitude toward the war in Iran is an attitude on a specific topic and is less abstract than one's attitude toward war in general. In this case, one would expect attitudes toward war in general to have an influence on attitudes toward specific wars.

Chapter 14 discusses a general theory for change in hierarchically organized attitudes and is followed by a presentation of research designed to test different hierarchical models which is reported in Chapter 15. The attitude-behavior controversy is addressed from a hierarchical perspective and is reported in Chapter 16. Chapter 17 develops models of change in hierarchically organized attitudes using alternative theories of attitude change.

The development and use of communication and attitude change models is indeed pervasive. Communication and attitude change are topics of concern in a variety of disciplines: administration, advertising, business, communication, consumer behavior, decision sciences, education, journalism, management, marketing science, political science, psychology, sociology, and speech. By their very nature these topics have been and will probably remain multidisciplinary areas of study, and the

work presented here reflects that fact. The topical areas in this volume include psychology, sociology, communication, political science, and marketing science.

This volume was written for advanced undergraduate and graduate students whose training requires a comprehensive and rigorous treatment of attitude change. Its approach is eclectic; that is, we attempted to include all major theories of attitude change as well as other approaches to the study of communication, cognition, and change. Most of these theories, however, have not been previously quantified. The work presented in this volume is devoted primarily to deriving mathematical models from the major (and minor) premises of the major theories of attitude change. That is, each theory is represented by a family of models that are common in major premises but differ in minor premises. A working knowledge of algebra and sequences and familiarity with calculus and matrix algebra are the only mathematical tools required. In nearly all cases, the theories and models are verbally described before translation to equations.

We wish to give special thanks to those who made contributions to selected chapters in this volume: T. Daniel Coggin (Chapter 11), Ralph L. Levine (Chapter 14), O. Karl Mann (Chapter 13), M. Scott Poole (Chapters 15 and 16), Scott E. Sayers (Chapter 14), and Joseph Woelfel (Chapter 12).

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CHAPTER 1

Introduction

This book is devoted to the development of mathematical models of attitude change and group processes. The book uses contemporary theory for the development of the mathematical models. We present the core of each theory in a way that renders a direct comparison and contrast among each of the theories. Narrative presentations of most of the theories presented in this book are available in the classic works of Insko (1967) and Kiesler *et al.* (1969). A more recent review of contemporary and classic theories of attitude change is given by Petty and Cacioppo (1981).

The connecting thread among all models is *communication*. All of the mathematical models developed in this book contain most of the major components of the communication process: source, message, receiver, and effects. Channels of communication are not explicitly considered. Our major area of emphasis is the change produced by the message, that is, changes in attitude toward an object, attitude toward the source of the message, beliefs about the object, and behavioral intentions.

SOME IMPORTANT DEFINITIONS

Contemporary theories of attitude change have been plagued by a proliferation of incompatible definitions of the term attitude (see Fishbein and Ajzen, 1975). The term “attitude” has been used for emotional states, behavioral