

The background of the book cover is a complex, layered composition. It features a dark, mottled purple and blue base with lighter, textured areas. A small, dark, irregular object is visible in the upper right. A circular, blue, spiral-like object is positioned in the middle right. A large, pink, lily-like flower is at the bottom. A dark, angular shape is in the lower right. The overall effect is one of depth and artistic abstraction.

*R. H. Ettinger
Robert L. Crooks
Jean Stein*

Psychology
Science, Behavior, and Life
Third Edition

Psychology

Science, Behavior, and Life

Third Edition

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Eastern Oregon State College

Robert L. Crooks
Portland Community College

Jean Stein

Harcourt Brace College Publishers

*Fort Worth Philadelphia San Diego New York Orlando Austin San Antonio
Toronto Montreal London Sydney Tokyo*

For my family

BOB CROOKS

In memory of my father, Norman H. Ishler

JEAN STEIN

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Psychology

Science, Behavior, and Life

P R E F A C E

We live in an age in which science and technology have revolutionized the way we view the world, yet many students fail to realize that scientific methods can also be applied to the study of human behavior. While many students have no difficulty mastering numerous facts and theories, their behavior appears to be little changed by this experience. That is, there is little evidence that a first course in psychology has changed the way they interpret behavioral events. Perhaps this is because it is so difficult to remain objective about behavior—and perhaps it is due, in part, to the ways in which texts present and support principles of psychology.

If psychology is a science, then it should be presented as a science. Throughout this text we have attempted to involve students actively in the discovery process by inviting them to question assumptions and to participate in the scientific process of supporting or refuting ideas. Although the text is rich with content, it endeavors to bring students, and their own behavior, closer to the scientific process of observation and control.

The text was originally conceived with the aim of presenting psychology as an active scientific discipline. We offered students a unique array of features not found in the numerous other texts available to them. It is our belief that earlier editions of this text were successful in these attempts. The enthusiastic response by both students and instructors to the first two editions served as encouragement for this revised edition. We hope that you find the book as stimulating to read as we did to write.

Throughout this new edition we have attempted to keep the features that were successful in previous editions, while at the same time incorporating new research in areas where significant developments have occurred. As a result, we have a text that is both up-to-date and continues to present the diverse discipline of psychology in an engaging and challenging manner.

The major goals for this revision were essentially the same as those of the previous editions: First, we wanted to demonstrate to students how the science of psychology has evolved and continues to develop. Second, we wanted to make the content of the text both accurate and academically challenging to students of varying levels of academic ability while at the same time keeping it interesting and relevant to their lives. Third, we wanted to create a textbook that engaged students in the scientific process by asking stimulating questions and demonstrating how scientific research proceeds to answer them. And, finally, we wanted to introduce students to several contemporary and influential psychologists in order to show them how researchers think about important issues as well as to illustrate how controversy still surrounds much of this important discipline. We believe that it is important to show students how we know what we know by discussing facts of psychology in terms of the scientific context in which they are demonstrated. More importantly we discuss the methods of research throughout

the text as we display hundreds of classic and contemporary experiments in detail. There are more than 2500 references to published research, much of it published since 1990.

Special Features

What makes this text different from others that are also well grounded in current research is the way in which research is presented. We attempt to demonstrate how research evolves from simple questions about behavior. We then show how research answers these questions and how theories of psychology develop from research. In many cases we discuss how both the questions and the research are influenced by individual personalities and the political climate of the time. Psychology, like any other science, is a dynamic, social process within which our knowledge continually changes.

CRITICAL QUESTIONS Throughout each chapter there are numerous questions that students are asked to consider and attempt to answer. Immediately following many of these questions are descriptions of research designed to answer them. Students are thus led through the research process so that they become accustomed to how questions lead to research and research provides answers. In many cases research does not lead to clear answers and we discuss how to evaluate both sides of an issue critically.

HEALTH PSYCHOLOGY AND LIFE SEGMENTS At the end of selected chapters we discuss important topics related to health psychology. In these segments we attempt to show how current psychological research can lead to ways to improve our health and well-being. In addition, these segments demonstrate to students how basic research, often with animals, can lead to important human applications.

PERSPECTIVES ON RESEARCH Dispersed throughout the text are several discussions with psychologists who are currently engaged in research. In each case we have selected two psychologists to discuss the same topic from different perspectives. Students will quickly see that there are few black-and-white positions in psychology. Rather, there is currently considerable disagreement among researchers about important issues. These discussions also serve to familiarize students with several important psychologists by allowing students to “hear” these discussions as they occurred.

Supplements

FOR THE STUDENT *Study Guide* Each chapter consists of learning objectives, a chapter summary, matching exercises, true/false statements, multiple choice questions, and review diagrams and charts. Additionally, the study guide contains application exercises which challenge students to apply chapter content to “real life” situations and/or problems, and critical thinking exercises that encourage students to analyze and evaluate psychological research and concepts.

ExamTutor This computerized study guide allows the student to review a chapter by answering questions grouped around learning objectives or by selecting randomly from whole chapters. The student can create reviews covering one or more chapters.

Psychlearn This computer simulation software allows students to review important concepts and participate in and manipulate psychological experiments. Topics include: Reaction Time Laboratory, Schedules of Reinforcement, Short-Term Memory, and the Self-Consciousness Scale.

Instructor's Resource Kit Prepared by Josephine Wilson of Wittenberg University, this contains learning objectives coordinated with the student study guide, lecture suggestions, discussions, activities, Whole Psychology Catalog handouts, 122 overhead transparencies, and audiovisual resources, including a coordination guide for the Dynamic Concepts in Psychology videodisc. Each chapter also features suggestions for fostering critical thinking about research and bringing biological and physiological material into the presentation of psychology. Also included is a built-in Video Instructor's Manual for users of the Harcourt Brace Teaching Modules.

Test Bank Prepared by Lisa Valentino of Seminole Community College, this contains approximately 150 multiple-choice questions for each chapter of the text. Each question is linked to a learning objective and a page in the text on which the answer can be found and is also identified as one of three cognitive types: definition, knowledge and application. Each chapter contains 10–15 test items that appear in the student Study Guide as well.

Computerized Test Bank Available in IBM, Macintosh, and Apple II formats, Harcourt Brace's new testing software, **ExaMaster™**, allows you to create tests using fewer keystrokes, with all steps defined in easy-to-follow screen prompts. ExaMaster offers the following three easy-to-use options for test creation.

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If questions arise, our Software Support Hotline is available Monday through Friday, 9 AM–4 PM Central Time at 1 (800) 447-9457.

Dynamic Concepts in Psychology Developed by John Mitterer of Brock University exclusively for Harcourt Brace, this innovative video disc program covers every major concept in introductory psychology. Numerous computer animated sequences, film and video footage, still images, and demonstrations vividly illustrate each topic, bringing psychology to life in the classroom. Easy-to-use features and modular format allow instructors to customize the program to their course. *Lecture Builder*, a Level III software package available for IBM® or Macintosh®, allows instructors to pre-program classroom presentations and to import material from other video discs.

A detailed Instructor's Manual, fully keyed to concepts and to *Psychology: Science, Behavior, and Life*, Third Edition, offers complete instructions for using the video disc and Lecture Builder software.

The Harcourt Brace Video Library Five different video sources are available as supplemental teaching aids: The Discovering Psychology Telecourse, the Harcourt Brace Teaching Video Modules from the Discovering Psychology Telecourse, PBS' "The Brain" Series teaching modules, CBS' "60 Minutes" segments, and PBS' "Nova" series.

Discovering Psychology Telecourse Faculty Guide This supplement was created for use with the Telecourse and provides the link between the text and the Telecourse Units. Included are page references to the text and synopses of the Telecourse Units, along with readings, activities, and test questions related to each Unit.

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THE FUNCTION OF SLEEP



This scene from the film They Shoot Horses, Don't They? depicts a dance marathon popular in the 1930s and 1940s, where contestants who danced the longest won prizes. Prolonged periods of sleep deprivation can produce hallucinations and delusions.

neurotransmitter acetylcholine is believed to be directly involved in dreaming and REM sleep. Injections of acetylcholine into the pons of animals can cause REM sleep leading to the remark that "Acetylcholine is the stuff of which dreams are made" (Palca, 1989).

IS SLEEP NECESSARY? In a widely reported personal experiment in 1959, New York disc jockey Peter Tripp staged a wakeathon, remaining awake for 200 hours. It was not easy. Halfway through his wakeathon, he began to hallucinate. His ability to think and reason deteriorated dramatically, and by the end of his ordeal he was unable to distinguish between fact and fantasy. He also became increasingly paranoid. At one point, Tripp was convinced that a physician who had arrived to examine him was planning to haul him off to jail (Luce, 1965).

SLEEP DEPRIVATION STUDIES Peter Tripp's experience, though fascinating, is of limited scientific value because it took place in an uncontrolled environment. Several subsequent studies have been carefully controlled, and they provide more reliable findings. In one experiment, for instance, six volunteers were deprived of sleep for 205 consecutive hours (Kales et al., 1970). By the end of the third day, subjects were hallucinating and experiencing delusions (false or distorted beliefs). They also developed hand tremors, double vision, and reduced pain thresholds. Their reflexes were largely unimpaired, however, and physiological functions such as heart rate, respiration, blood pressure, and body temperature showed little change from normal throughout the course of the experiment. After the experiment was over, no long-term effects were evident. Subjects slept a few days, then awoke feeling fine.

In another experiment conducted by famed sleep researcher William Dement (1972), a 17-year-old subject stayed awake for 268 consecutive hours, after which he needed only 14 hours of sleep to recover to a normal state. In contrast to Peter Tripp, this young man remained lucid and coherent throughout his vigil.

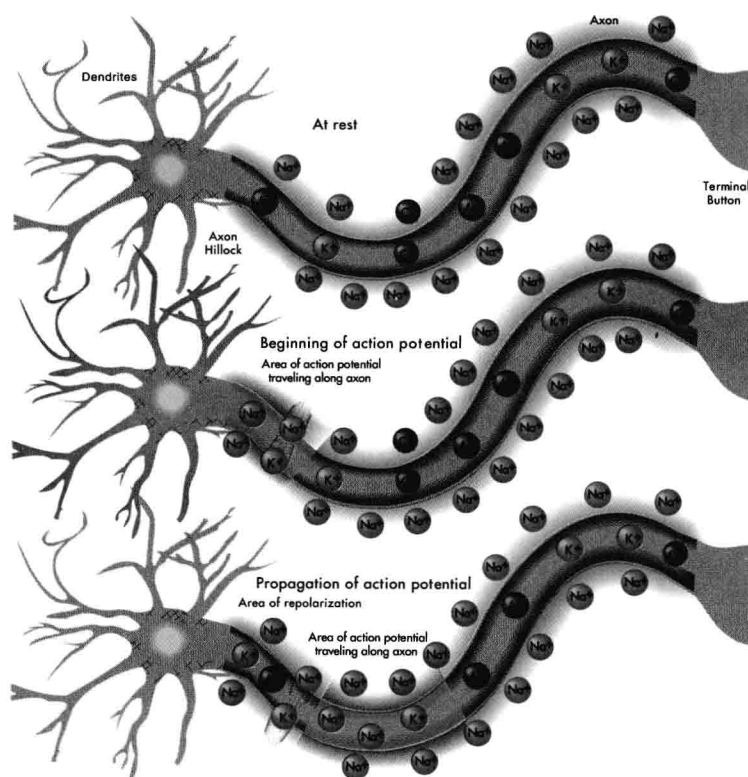
Findings such as these caused some researchers to question the importance of sleeping in our lives. A few even speculated that people might learn to get by without any sleep, particularly if scientists could isolate the factor that makes us sleepy and find a way to counter it. With this idea in mind, a team of researchers at the University of Chicago Sleep Research Laboratory devised an ingenious device to study the effects of total sleep deprivation in rats.

Rats were studied in pairs: One was deprived of sleep, and the other acted as a control. Both rats were placed on a plastic disk located above a water pan, as shown in Figure 5.7. If the disk rotated, the rats had to walk to avoid falling into the water. The rats were connected to an EEG that monitored their brain waves. Whenever the sleep-deprived rat fell asleep, the EEG registered the changes and opened a circuit, causing the disk to rotate. Both rats would have to walk to avoid falling into the water. The control rat could sleep when his counterpart was awake, but the sleep-deprived rat was jarred awake at each lapse of consciousness. The sleep-deprived rats lasted as long as 33 days, but they all eventually died. In contrast, all the control animals survived, apparently no worse for the experience (Rechtschaffen et al., 1983). A more recent experiment by researchers in the same laboratory, using the same research design and apparatus, reported similar results. All 10 of the totally sleep-deprived rats in this study died within 11 to 32 days, whereas all paired controls survived (Everson et al., 1989).

In both of these experiments, the University of Chicago scientists were unable to determine the precise cause of death. A variety of sleep deprivation effects were observed prior to death, including a progressively scrawny appearance, skin ulcers, increased food intake, weight loss, an increase in energy expenditure, a

EXPLANATIONS OF RESEARCH

Research presented in a unique manner tells the stories of psychological researchers: the questions they asked, the studies they conducted to answer the questions, and the theories they developed as a result of those studies.



transmitter substances from the terminal buttons, thus making them 'talk' to the receiving cells (Carlson, 1981, p. 47).

THE ALL-OR-NONE LAW Unlike the graded potential, the strength of an action potential does not vary according to the degree of stimulation. Once a nerve impulse is triggered within an axon, it is transmitted the entire length of the axon with no loss of intensity. Partial action potentials or nerve impulses do not occur; thus an axon is said to conduct without decrement. Because of this, the nerve impulse in the axon is said to follow the **all-or-none law**: If the sum of the graded potentials reaches a threshold, there will be an action potential; if the threshold is not reached, however, no action potential will occur.

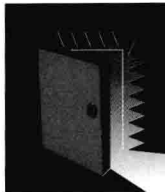
FIGURE 3.4

A. Neuron at rest. Resting membrane potential is maintained by distribution of charged ions on either side of cell membrane. B. Initiation of action potential. Action potential is initiated at axon hillock by movement of sodium (Na^+) ions to inside of cell. C. Movement of action potential. Action potential moves (propagates) along axon as Na^+ ions enter cell. After an action potential occurs, membrane potential is restored by movement of both potassium (K^+) and sodium (Na^+) ions from the cell.

ANATOMICAL ART

Original art enhances student understanding of biologically-oriented material.

RESEARCH PERSPECTIVES



PERSPECTIVE #1

Dr. A. Charles Catania

A. Charles University of prior analyst work and function his Ph.D. in University, where, he ran a fellow and for more than 10 analysis of behavioral verbal behavior.



PERSPECTIVE #1

Q: Dr. Cata
and behavioral

A: In cognitive things that the cognitivists are studying, it responds in some theoretical event. In those kinds of things, the consequences of behavior psychology is that it was worth it. The idea is that, but because. And it's hard to. It didn't also include the world.


24

RESEARCH PERSPECTIVES



PERSPECTIVE #2

Dr. Stephen M. Kosslyn



Stephen M. Kosslyn is professor of psychology at Harvard University. He received his graduate education at Stanford University, where he was involved in research using ideas and concepts from artificial intelligence. His current work involves using techniques such as PET and MRI to map brain activity during various tasks including mental imagery and higher-level perception. He hopes to gather information that can help psychologists understand how the mind arises from activity of the brain. He is also working to apply results of this work to understanding migraines, obsessive-compulsive disorder, and the mechanisms that underlie placebo effects.

One of the central ideas in the work of B. F. Skinner has all kinds of implications for this question. Skinner wrote a paper in 1945 in which he was concerned about the philosophy of science, how people come to know things, and he asked how we could learn the words for our private feelings, our private emotions. How could a group of people agree on the vocabulary for that sort of thing? Skinner suggested some ways in which that could happen. Suppose you wanted to teach a word for a certain kind of pain, like a sharp pain or a dull pain. This is supposed to be a private sensation and psychologists are interested in the nature of these private things like sensations. Skinner proposed that the only way in which a verbal community could come up with a consistent language for private things was for the verbal community to base it on public behavior. Therefore, we only can learn about the ways of talking about private things through the public terms for them. So, for example, if you're hurting, that's a private thing. Nobody else can feel your pain. How can we teach people when it's appropriate to say "I'm hurt"? We do it by learning words for public things like parts of the body. When a child falls down, scrapes an elbow, or the child is crying, these are public kinds of things and the parents can teach the children the public words. So all of our language begins with what's public. We learn words like "I'm angry, I'm happy, I'm afraid" in large part on the basis of seeing how people act and seeing what kind of situations they're in. In my courses I occasionally arrange an experiment in the classroom. For example, I unexpectedly come in the classroom with

25

RESEARCH PERSPECTIVES

An interview forum in which two psychologists offer different perspectives on a single topic. Shows students how researchers think about important issues and illustrates how controversy still surrounds much of this discipline.



CLASSICAL CONDITIONING OF THE IMMUNE SYSTEM

A few years ago, researchers Robert Ader and Nathan Cohen (1982) observed a curious effect as they were studying classically conditioned taste aversion. In their experiment, rats were given drinks of a saccharin-flavored water (the CS) followed immediately by injections of a drug that made them nauseous (the UCS). As you might predict, the animals immediately acquired a taste aversion that caused them to avoid or reduce their consumption of the sweet solution. The rats were then exposed to several extinction trials in which they were presented with the sweet solution but no toxic drug. (Extinction is a process designed to reduce the strength of the association between the CS and UCS through repeated presentations of the CS alone without the UCS.)

During this stage of the study, something unexpected happened. For no apparent reason, some of the rats died. Ader and Cohen considered a variety of possibilities to explain what had happened. One of their primary clues was that the drug they used to induce nausea, cyclophosphamide, is also known to suppress the body's immune system.

Ader and Cohen reasoned that perhaps the saccharin water had become a conditioned signal that suppressed the rats' immune systems in the same way as the drug with which it had been paired. If this were the case, the repeated exposures to the sweetened water alone during the extinction trials may have suppressed their immune systems so much that they fell victim to disease-bearing microorganisms in the laboratory.

To test this possibility, they conditioned other rats, using the original design with one modification. Before the extinction trials in which rats received only the CS of sweet water, they were injected with red blood cells from sheep foreign bodies that would normally trigger the rats' immune systems to produce high levels of defensive antibodies. The researchers' hypothesis was supported: The conditioned animals produced significantly fewer antibodies than control animals for whom the sweet water was not a CS.

Ader and Cohen also tested the immune-system responses of mice who had been classically conditioned to respond to the sweet water. They found that if these conditioned mice received only half the usual dosage of cyclophosphamide, together with exposure to the CS, their immune systems were suppressed as completely as if they had been given a full dosage of the toxic drug.

Other researchers have confirmed and extended Ader and Cohen's findings. For instance, Grochowski et al., (1991) demonstrated that conditioned immunosuppression effectively prolonged the survival of transplanted heart tissue in rats. Immunosuppression in tissue transplant procedures is necessary to prevent the immune system from attacking the newly transplanted tissue.

HEALTH IMPLICATIONS

Certainly, these findings extend our knowledge of how the mind and body interact to reduce or increase our vulnerability to disease. But beyond this, they may lead to a practical medical application in the future. Consider, for instance, that a major problem associated with many drugs used to combat disease is that they often produce serious side effects. For example, although cyclophosphamide is toxic enough to have been selected as the nausea-inducing UCS in Ader and Cohen's experiment, it has a legitimate and very valuable medical use as treatment for lupus, an immune-system disorder in which the body turns against itself. If classical conditioning could be used to condition the body of a lupus victim into responding to a significantly lowered dosage of the drug, a diseased person might be able to benefit from cyclophosphamide without having to experience its debilitating side effects. Experiments are currently being conducted with lupus patients to determine whether conditioned immunosuppression can effectively augment drug therapy.

The same kinds of benefits might also be obtained with drugs used to treat cancer and AIDS. Hopefully, in the years to come these conditioning principles can be applied to alleviate suffering and improve the treatment of many victims of disease.

HEALTH PSYCHOLOGY AND LIFE DISCUSSIONS

Shows the practicality and relevance of the science of psychology, frequently providing the tips, techniques, and suggestions for applying psychology to deal with concerns in students' own lives.

Psychology

Science, Behavior, and Life



CHAPTER 1

The Origins of Psychology

CHAPTER 2

The Methods of Psychology

CONTENTS IN BRIEF

Part 1

Nature, Origins, and Methods of Psychology

Chapter 1	The Origins of Psychology	2
Chapter 2	The Methods of Psychology	32

Part 2

Biological Foundations, Perception, and Sleep

Chapter 3	The Biology of Behavior	60
Chapter 4	Sensation and Perception	110
Chapter 5	Consciousness: Sleep, Dreaming, and Hypnosis	166

Part 3

Learning, Memory, Cognition, Motivation and Emotion

Chapter 6	Learning and Behavior	196
Chapter 7	Memory	232
Chapter 8	Motivation	272
Chapter 9	Emotion and Stress	314
Chapter 10	Cognition: Thinking and Language	348

Part 4

Developmental Processes and Individual Differences

Chapter 11	Development 1: Conception through Childhood	402
Chapter 12	Development 2: Adolescence to the End of Life	452
Chapter 13	Intelligence	484
Chapter 14	Personality: Theories and Assessment	522

Part 5

The Nature and Treatment of Behavioral Disorders

Chapter 15	Behavioral Disorders	562
Chapter 16	Treatment of Behavioral Disorders	620

Part 6

Social Psychology

Chapter 17	Social Psychology	660
------------	-------------------------	-----

TABLE OF CONTENTS

Part 1

Nature, Origins, and Methods of Psychology.....1

1	<i>The Origins of Psychology</i>	2
	THE STUDY OF PSYCHOLOGY	3
	DEFINITION OF PSYCHOLOGY	4
	Psychology as a Science.....	4
	The Study of Behavior	5
	Studying Humans and Other Animals.....	6
	<i>Learning about Psychology from Nonhuman Animals</i>	6
	PSYCHOLOGY'S HISTORY	8
	Structuralism	9
	<i>William Wundt (1832–1920)</i>	9
	<i>Problems with Structuralism</i>	9
	Functionalism.....	10
	<i>William James (1842–1910)</i>	10
	Psychoanalysis	10
	<i>Sigmund Freud (1856–1939)</i>	10
	Behaviorism.....	11
	<i>John Watson (1878–1958)</i>	11
	Gestalt Psychology.....	12
	<i>Wolfgang Köhler (1887–1967)</i>	12
	Humanistic Psychology	13
	<i>Abraham Maslow (1908–1970)</i>	13
	CONTEMPORARY PSYCHOLOGY.....	14
	Fields of Specialization in Psychology	14
	Cognitive Psychology	14
	Developmental Psychology	14
	Social Psychology.....	14
	Personality Psychology	15
	Experimental Psychology	15
	Biological Psychology.....	15
	Clinical and Counseling Psychology.....	16
	Educational and School Psychology	16
	Industrial/Organizational Psychology	17
	Engineering Psychology	17
	Health Psychology	17
	Forensic Psychology.....	18
	Artificial Intelligence and Connectionism	18
	The American Psychological Association	19
	THE GOALS OF PSYCHOLOGY.....	20