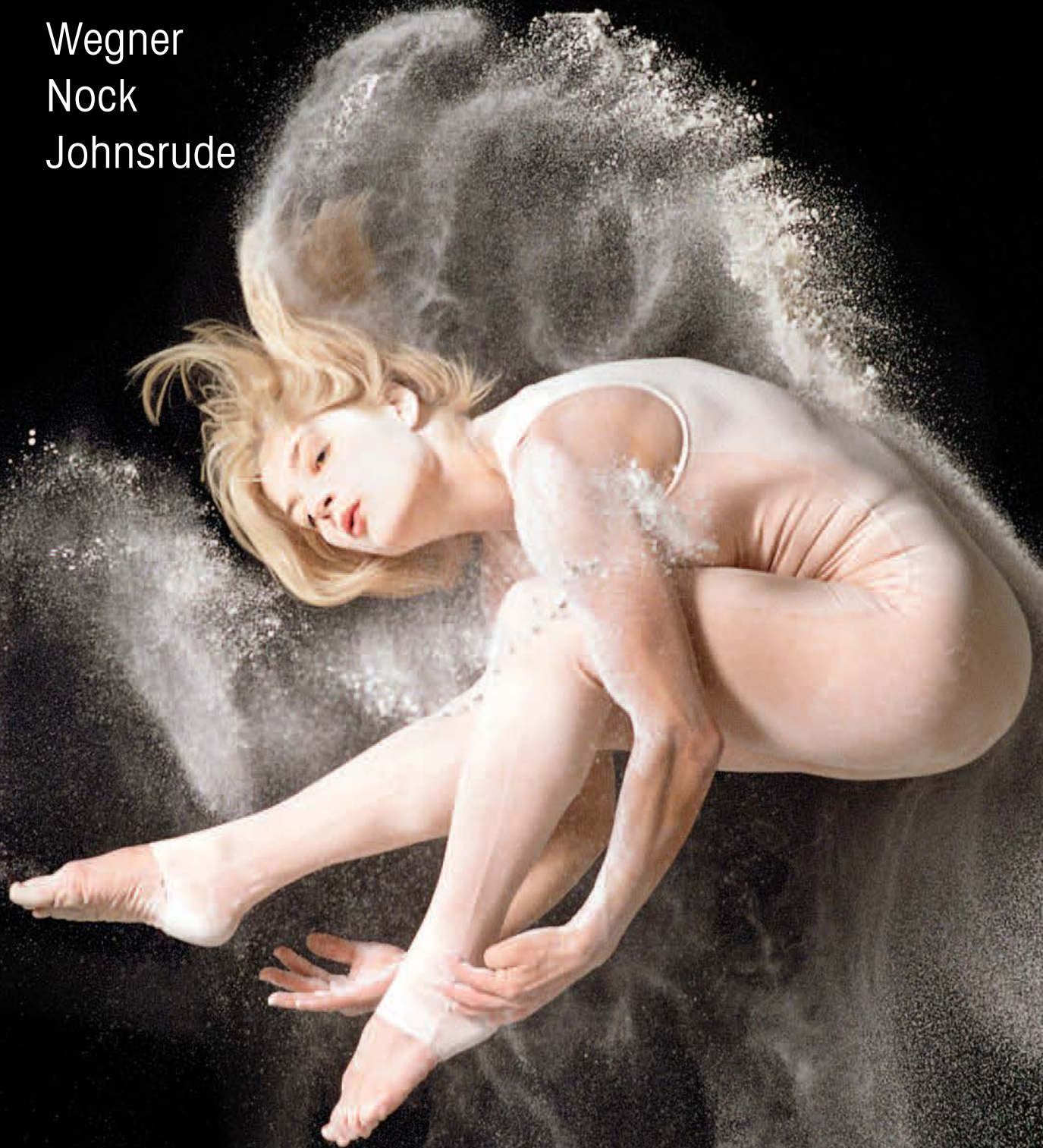


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Johnsrude



# PSYCHOLOGY

THIRD CANADIAN EDITION

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# PSYCHOLOGY

THIRD CANADIAN EDITION

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*We dedicate this edition to the  
memory of Dan Wegner, our  
co-author, colleague, and deeply  
missed friend.*

# About the Authors



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**Daniel Schacter** is William R. Kenan, Jr., Professor of Psychology at Harvard University. Dan received his B.A. degree from the University of North Carolina at Chapel Hill. He subsequently developed a keen interest in amnesic disorders associated with various kinds of brain damage. He continued his research and education at the University of Toronto, where he received his Ph.D. in 1981. He taught on the faculty at Toronto for the next 6 years before joining the psychology department at the University of Arizona in 1987. In 1991, he joined the faculty at Harvard University. His research explores the relationship between

conscious and unconscious forms of memory, the nature of distortions and errors in remembering, and the ways in which we use memory to imagine future events. Many of Schacter's studies are summarized in his 1996 book, *Searching for Memory: The Brain, The Mind, and The Past*, and his 2001 book, *The Seven Sins of Memory: How the Mind Forgets and Remembers*, both winners of the APA's William James Book Award. Schacter has also received a number of awards for teaching and research, including the Harvard-Radcliffe Phi Beta Kappa Teaching Prize, the Warren Medal from the Society of Experimental Psychologists, and the Award for Distinguished Scientific Contributions from the American Psychological Association. In 2013, he was elected to the National Academy of Sciences.



COURTESY OF DANIEL GILBERT

**Daniel Gilbert** is Edgar Pierce Professor of Psychology at Harvard University. Dan received his B.A. from the University of Colorado at Denver and his Ph.D. from Princeton University. From 1985 to 1996 he taught at the University of Texas, Austin, and in 1996 he joined the faculty of Harvard University. He has received the American Psychological Association's Distinguished Scientific Award for an Early Career Contribution to Psychology, the Diener Award for Outstanding Contributions to Social Psychology, and has won teaching awards that include the Phi Beta Kappa Teaching Prize and the

Harvard College Professorship. His research focuses on how and how well people think about their emotional reactions to future events. He is the author of the international best seller *Stumbling on Happiness*, which won the Royal Society's General Prize for best popular science book of the year, and he is the co-writer and host of the PBS television series, *This Emotional Life*.



DANIEL WEGNER

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from the American Psychological Association, and the Distinguished Scientist Award from the Society of Experimental Social Psychology. His research focused on thought suppression and mental control, transactive memory in relationships and groups, and the experience of conscious will. His work on thought suppression and consciousness served as the basis of two popular books, *White Bears and Other Unwanted Thoughts* and *The Illusion of Conscious Will*, both of which were named *Choice* Outstanding Academic Books. He died in 2013.



NICOLAS GUEVARA

**Matthew Nock** is a Professor of Psychology at Harvard University. Matt received his B.A. from Boston University (1995) and his Ph.D. from Yale University (2003), and he completed his clinical internship at Bellevue Hospital and the New York University Child Study Center (2003). Matt joined the faculty of Harvard University in 2003 and has been there ever since. While an undergraduate, Matt became very interested in the question of why people do things to intentionally harm themselves, and he has been conducting research aimed at answering this question ever since. His research is multidisciplinary in nature and uses a range of methodological approaches (e.g., epidemiologic surveys, laboratory-based experiments, and clinic-based studies) to better understand how these behaviours develop, how to predict them, and how to prevent their occurrence. He has received multiple teaching awards at Harvard, four early career awards recognizing his research, and in 2011 was named a MacArthur Fellow.



PHOTO BY ERIC BROUSSEAU

**Ingrid Johnsrude** is Professor of Psychology at the University of Western Ontario where she is also the Research Chair at the Brain and Mind Institute and School of Communication Sciences and Disorders. Previously, she was Associate Professor of Psychology and Canada Research Chair in Cognitive Neuroscience at Queen's University where she directed the Cognitive Neuroscience of Communication and Hearing (CoNCH) lab. Ingrid received her B.Sc. from Queen's University (1989), and her M.Sc. and Ph.D. from McGill University (1992, 1997), where she was supervised by internationally renowned psychologist, Brenda Milner. After earning her doctorate, she spent time in the United Kingdom as a postdoctoral fellow at University College London and then as an Investigator Scientist in Cambridge, before returning to Queen's to join the faculty there. During her time in England, she contributed to a paper showing that taxi drivers in London with extensive navigation experience have larger hippocampi than the general population, revealing one of the ways that experience can alter the structure of the human brain. This finding, notable for both the content of the study and the pioneering methods used, is a common example in introductory psychology texts. Ingrid's principal area of investigation is the neural basis of understanding speech, and she leads experiments examining how utterances are transformed into acoustic signals and then into meaning via a variety of cognitive processes. Her investigations span multiple levels—from understanding the brain structures involved in hearing and comprehension to observing the ways listeners deal with challenges such as background noise.

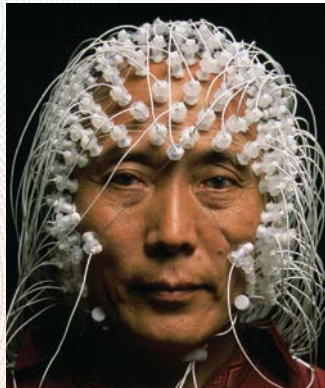
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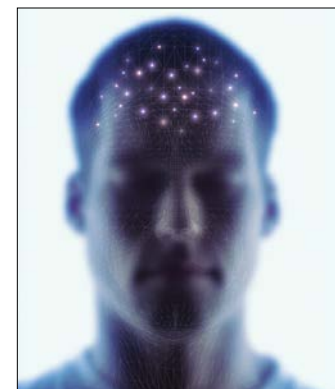
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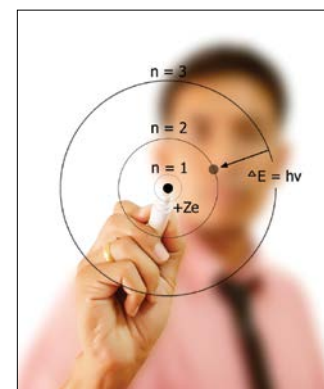
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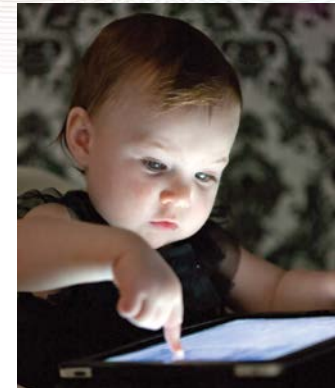


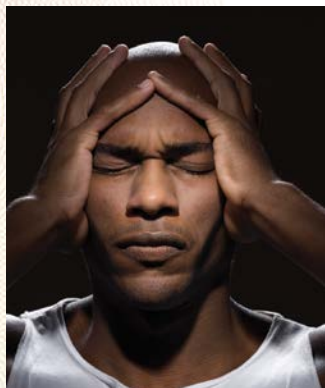
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# Preface

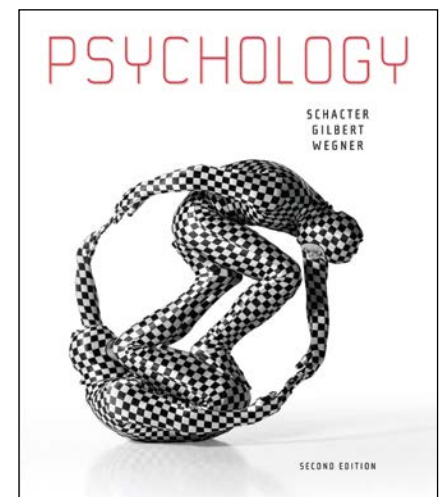
Why are you reading the preface? The book really gets going in about 10 pages, so why are you here instead of there? Are you the kind of person who cannot stand the idea of missing something? Are you trying to justify the cost of the book by consuming every word? Did you just open to this page out of habit? Are you starting to think that maybe you made a big mistake?

For as long as we can remember, we have been asking questions like these about ourselves, about our friends, and about anyone else who did not run away fast enough. Our curiosity about why people think, feel, and act as they do drew each of us into our first psychology course, and though we remember being swept away by the lectures, we do not remember much about our textbooks. That is probably because those textbooks were little more than colourful encyclopedias of facts, names, and dates. Little wonder that we sold them back to the bookstore the moment we finished our final exams.

When we became psychology professors, we did the things that psychology professors often do: We taught classes, we conducted research, and we wore sweater vests long after they stopped being fashionable. We also wrote stuff that people truly enjoyed reading, and that made us wonder why no one had ever written an introductory psychology textbook that students truly enjoyed reading. After all, psychology is the single most interesting subject in the known universe, so why should a psychology textbook not be the single most interesting object in a student's backpack? We could not think of a reason, so we sat down and wrote the book that we wished we had been given as students. The first American edition of *Psychology* was published in 2008, and the reaction to it was nothing short of astounding. We had never written a textbook before, so we did not know exactly what to expect, but never in our wildest dreams did we imagine that we would *win the Pulitzer Prize!*

Which was good, because we did not. But what did happen was even better: We started getting letters and emails from students all over the country who just wanted to tell us how much they liked reading our book. They liked the content, of course, because as we may have already mentioned, psychology is the single most interesting subject in the known universe. But they also liked the fact that our textbook did not *sound* like a textbook. It was not written in the stodgy voice of the announcer from one of those nature films that we all saw in seventh grade biology (“Behold the sea otter, nature’s furry little scavenger”). Rather, it was written in *our* voices—the same voices in which we talk to our students, our spouses, our kids, and our pets. We made a conscious effort to tell the *story* of psychology—to integrate topics rather than just list them, to illustrate ideas rather than just describe them. We realized that because science is such a complicated and serious business, some teachers might think that a science textbook should be complicated and serious too. We did not see it that way. We think writing is the art of making complicated things seem simple and of making serious things seem fun. The students who sent us nice letters seemed to agree (even if the Pulitzer Prize committee did not).

The last edition of our book was a hit—so why have we replaced it? Two reasons. First, we got tired of being asked about the two guys in checkerboard leotards who were cavorting on the cover. They are gone now, and we are only going to say this one more time: No, they were not any of us, and yes, they probably did use superglue. The second and somewhat more important reason for bringing out a new edition is



that things change. Science changes (psychologists know all sorts of things about the mind and the brain that they didn't know just a few years ago), the world changes (when we wrote the first edition, no one had heard of an iPad or Barack Obama), and we change (our research and reading gave us new perspectives on psychological issues, and our writing and teaching showed us new ways to help students learn). With all of these changes happening around us and to us, we felt that our book should change as well and now we are adding a Canadian edition, which is based on the third edition. So we are calling this edition the Third Canadian Edition.

## Changes in the Third Edition

### New focus on critical thinking

As sciences uncover new evidence and develop new theories, scientists change their minds. Some of the facts that students learn in a science course will still be facts a decade later, and others will require qualification or will turn out to have just been plain wrong. That's why students not only need to learn the facts but also how to *think* about facts—how to examine, question, and weigh the evidence that scientists produce. We emphasize this sort of critical thinking throughout our text, of course, but in this edition, we have included a new section dedicated entirely to helping students think about the mistakes human beings make when they try to consider evidence (see “Thinking Critically about Evidence” in Chapter 2: Methods in Psychology, page 66). We hope this section will help students learn how to use empirical evidence to develop well-grounded beliefs—not only about psychological science but also about the stuff of their everyday lives.

### New section “Learning in the Classroom”

Like other psychology textbooks, the first two editions of our text provided in-depth coverage of many different kinds of learning, ranging from classical conditioning to observational learning. This edition still does this. But strangely enough, the Learning chapters in most psychology texts, including the previous two editions of this text, have not said much about the very kind of learning that is most relevant to our readers: learning in the classroom. We think that it is about time to change this puzzling state of affairs, and so we have. Chapter 7 now includes a new section on learning in the classroom that summarizes some of the exciting recent developments in this area, including evaluation of the most effective study techniques, insights into cognitive illusions that can mislead us into studying ineffectively, research on how to improve attention and learning during lectures, and discussion of the prospects for online learning. The Learning chapter should be relevant to the lives of students, and we have done our best to make it so.

### New research

A textbook should give students a complete tour of the classics, of course, but it should also take them out dancing on the cutting edge. We want students to realize that psychology is not a museum piece—it is not just a collection of past events but also of current events—and that this young and evolving science has a place for them if they want it. So we have packed the third edition with information about what is happening in the field today. Not only have we included more than 400 new citations, but we have also featured some of the hottest new findings in the “Hot Science” boxes that you will find in every chapter.

Chapter Number	Hot Science
1	Psychology as a Hub Science, p. 34
2	Do Violent Movies Make Peaceful Streets?, p. 64
3	Epigenetics and the Persisting Effects of Early Experiences, p. 112
4	Taste: From the Top Down, p. 170
5	Disorders of Consciousness, p. 185
6	Sleep on It, p. 233
7	Dopamine and Reward Learning in Parkinson's Disease, p. 292
8	The Body of Evidence, p. 325
9	Sudden Insight and the Brain, p. 386
10	Dumb and Dumber?, p. 414
11	A Statistician in the Crib, p. 435
11	The End of History Illusion, p. 460
12	Personality on the Surface, p. 479
13	Mouse Over, p. 516
13	The Wedding Planner, p. 538
14	Can Discrimination Cause Stress and Illness?, p. 552
15	Optimal Outcome in Autism Spectrum Disorder, p. 615
16	"Rebooting" Psychological Treatment, p. 642

## Fully updated coverage of *DSM-5*

One area where there has been lots of new research—and lots of big changes—is in the study of psychological disorders. As you will learn, psychologists use a manual called the *Diagnostic and Statistical Manual of Mental Disorders (DSM)* to make decisions about which behaviours should be formally considered “disordered.” For instance, we all get sad from time to time, but when should extreme sadness be classified as a psychological disorder that should be treated? The *DSM* answers questions like this. After nearly 20 years of using the fourth edition of the *DSM (DSM-IV)*, the field of psychology now has an updated fifth edition (*DSM-5*), which was just published in 2013. Psychologists have learned a lot about psychological disorders over the past 20 years, and this third edition of our book contains updated information about how psychologists think about, define, and classify psychological disorders.

## New organization

We have rearranged our table of contents to better fit our changing sense of how psychology is best taught. Specifically, we have moved the chapter on Stress and Health forward so that it now appears before the chapters on Psychological Disorders and Treatment of Psychological Disorders. We think this change improves the flow of the book in several ways. First, as you will learn, the experience of stress has a lot to do with interpersonal events and how we respond to them, information that you will have just learned about in the chapters on Personality and Social Psychology. Second, current models of psychological disorders view them as resulting from an interaction of some underlying predisposition (e.g., genetic or otherwise) and stressful life events. Such models will be much more intuitive if you first learn about the body's stress response. Third, this chapter has information about health-promoting behaviours that could come in handy during exam season—and so better to tell you about them before the end of the semester!

## New Other Voices feature

Long before psychologists appeared on Earth, the human nature business was dominated by poets, playwrights, pundits, philosophers, and several other groups beginning with P. Those folks are still in that business today, and they continue

to have deep and original insights into how and why people behave as they do. In this edition, we decided to invite some of them to share their thoughts with you via a new feature that we call Other Voices. In every chapter, you will find a short essay by someone who has three critical qualities: (a) They think deeply, (b) they write beautifully, and (c) they know things we do not. For example, you will find essays by leading journalists such as David Brooks, Ted Gup, Tina Rosenberg, David Ewing Duncan, and Lisa Willemse; leading educators such as Robert Rothon; renowned legal scholar Elyn Saks; and eminent scientists such as biologist Greg Hampikian and computer scientist Daphne Koller. And just to make sure we are not the only psychologists whose voices you hear, we have included essays by Tim Wilson, Chris Chabris, Daniel Simons, V. S. Ramachandran, Stephen Porter, and Charles Fernyhough. Every one of these amazing people has something important to say about human nature, and we are delighted that they have agreed to

say it in these pages. Not only do these essays encourage students to think critically about a variety of psychological issues, but they also demonstrate both the relevance of psychology to everyday life and the growing importance of our science in the public forum.

Chapter Number	Other Voices
1	Is Psychology a Science?, p. 17
2	Can We Afford Science?, p. 75
3	Neuromyths, p. 124
4	Hallucinations and the Visual System, p. 156
5	The Blink of an Eye, p. 217
6	Early Memories, p. 261
7	Online Learning, p. 308
8	I Used to Get Invited to Poker Games ..., p. 329
9	Canada's Future Has to Be Bilingual, p. 364
10	How Science Can Build a Better You, p. 421
11	Men, Who Needs Them?, p. 429
11	You Are Going to Die, p. 467
12	Does the Study of Personality Lack ... Personality?, p. 503
13	91% of All Students Read This Box and Love It, p. 531
14	False Hopes and Overwhelming Urges, p. 579
15	Successful and Schizophrenic, p. 613
16	Diagnosis: Human, p. 653

### CHANGING MINDS

1. One of the MPPs from your province is supporting legislation that would impose heavy fines on aggressive drivers who run red lights. One of your classmates thinks this is a good idea. "The textbook taught us a lot about punishment and reward. It's simple. If we punish aggressive driving, its frequency will decline." Is your classmate right? Might the new law backfire? Might another policy be more effective in promoting safe driving?

A Changing Minds question from Chapter 13.

*gathering scientific information by und*



How do people respond when they know they are being observed?

several opponents at once (Erffmeyer

A cue question from Chapter 2.

## New Changing Minds questions

What can 784 introductory psychology professors agree about? They can agree that students usually come into their first psychology class with a set of beliefs about the field and that most of these beliefs are wrong. With the help of the wonderful people at Worth Publishers (they made us say that), we conducted a survey of 784 introductory psychology teachers and asked them to name their students' most common misconceptions about psychology. We then created the Changing Minds questions you will see at the end of every chapter. These questions

ask you first to think about an everyday situation in which a common misconception might arise, and then to use the science you have just learned to overcome that misconception. We hope these exercises will prepare you to apply what you learn—and maybe even change some minds about psychology (thereby justifying our corny title).

## Additional Student Support

### Practice

- *Cue questions* encourage critical thinking and help identify the most important concepts in every major section of the text.
- *Bulleted summaries* follow each major section to reinforce key concepts and make it easier to study for the test.



- A *Key Concept Quiz* at the end of each chapter offers students the opportunity to test what they know.
- *Critical thinking questions* are offered throughout the chapters within a number of the photograph captions, offering the opportunity to apply various concepts.

### Practical Application

What would the facts and concepts of psychology be without real-world application? Throughout this edition of the text, we provide lots of examples of how the material presented in this book applies to things that you will experience in the real world. For instance, each chapter contains a *The Real World* box that applies concepts from inside the book to your life outside the book. (We like this idea so much we even included a box in the Preface!) In addition, because culture influences just about everything we do—from how we perceive lines to how long we will stand in them—this edition continues to celebrate the rich diversity of human beings both in *Culture & Community* boxes and throughout the text, as detailed on the next page.



CLEMMENT PHILIP/ARTERRA PICTURE LIBRARY/ALAMY

According to the theory of natural selection, inherited characteristics that provide a survival advantage tend to spread throughout the population across generations. **Why might sensory adaptation have evolved? What survival benefits might it confer to a small animal trying to avoid predators? To a predator trying to hunt prey?**

Critical thinking questions in a photo caption from Chapter 4.

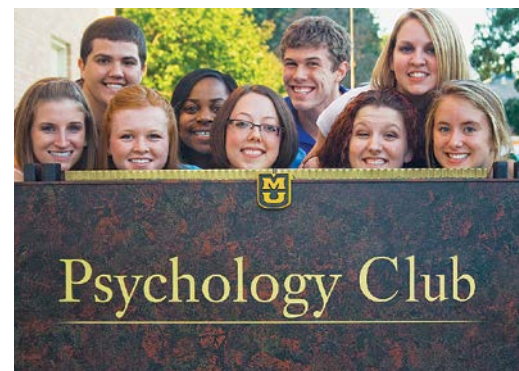
## THE REAL WORLD

### Join the Club!

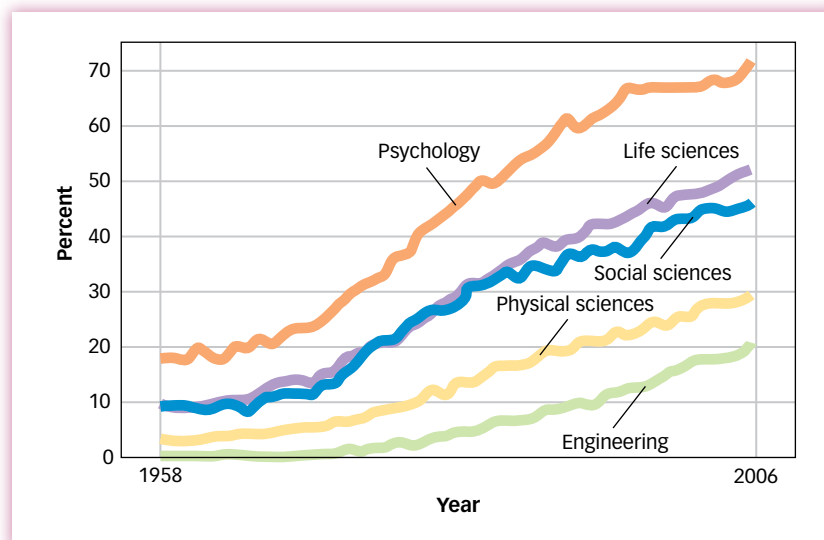
Once upon a time, Western science was the hobby of wealthy European gentlemen. Fortunately, the face of this field has changed profoundly since its early days and continues to progress even now.

In fact, social changes have led to openness and diversity in psychology more swiftly and completely than in most other fields of study. In 2006, for example, while women were only poorly represented in engineering and the physical sciences, they received more than 71% of all new Ph.D. degrees in psychology (Burrelli, 2008). As you can see in the accompany-

ing figure, although women are earning a growing proportion of Ph.D.s in all fields, they are now a whopping majority in psychology. Meanwhile, psychology Ph.D.s to Hispanic, African American, and Native American students have more than doubled from 1985 to 2005, and those to Asians and Pacific Islanders have tripled (National Science Foundation, 2008). It is now the future, and in this future, psychology is the science of everyone.



COURTESY UNIVERSITY OF MISSOURI PSI CHI & PSYCHOLOGY CLUB



Signs of the openness of psychology are all around. Just take a look at some of the students in undergraduate psychology clubs. Psychology students now are far more often women than men (77%) (Planty et al., 2008), and there is substantial representation of minority groups in psychology everywhere you look. Like its clubs, the study of psychology is open and welcoming to people of any age, sex, sexual orientation, race, different ability, colour, religion, or national or ethnic origin. Please join us!

◀ The proportion of new Ph.D.s earned by women in the United States has grown faster in psychology than in other fields (Burrelli, 2008). This trend is echoed in Canada (King, 2008).

**Chapter Number    The Real World**

1	The Perils of Procrastination, p. 4
1	Improving Study Skills, p. 10
2	“Oddsly” Enough, p. 61
3	Brain Plasticity and Sensations in Phantom Limbs, p. 104
3	Brain Death and the Vegetative State, p. 123
4	Multitasking, p. 146
4	Music Training: Worth the Time, p. 163
5	Anyone for Tennis?, p. 192
6	Is Google Hurting Our Memories?, p. 248
7	Understanding Drug Overdoses, p. 270
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9	From Zippers to Political Extremism: An Illusion of Understanding, p. 390
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13	Making the Move, p. 519
14	This is Your Brain on Placebos, p. 571
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7	Are There Cultural Differences in Reinforcers?, p. 281
8	Is It What You Say or How You Say It?, p. 330
9	Does Culture Influence Optimism Bias?, p. 378
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16	Treatment of Psychological Disorders around the World, p. 632

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## Preparing for the MCAT 2015

A complete correlation of the MCAT psychology topics with this book's contents is available for download from the Resources area of LaunchPad at <http://www.worthpublishers.com/launchpad/schacter3ecanadian>. In addition, since the MCAT represents a global standard for assessing the ability to reason about scientific information, the Test Bank for Psychology, Third Canadian Edition, features a new set of data-based questions for each chapter, which are designed to test students' quantitative reasoning. These questions are available for preview in LaunchPad.

MCAT 2015: Categories in Sensation and Perception	SGWNJ, <i>Psychology</i> , Third Canadian Edition, Correlations	
Content Category 6A: Sensing the environment	Section Title	Page Number[s]
<b>Sensory Processing</b>	Sensation and Perception	129–173
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• Thresholds	Measuring Thresholds	132–133
• Weber's Law	Measuring Thresholds	132–133
• Signal detection theory	Signal Detection	133–134
• Sensory adaptation	Sensory Adaptation	134–135
• Sensory receptors	Sensation and Perception Are Distinct Activities	130–132
• Sensory pathways	The Visual Brain	141–143
	Touch and Pain	164–167
	Body Position, Movement, and Balance	167
	Smell and Taste	168–173
• Types of sensory receptors	Vision I: How the Eyes and the Brain Convert Light Waves to Neural Signals	135–143
	The Human Ear	158–160
	The Body Senses: More Than Skin Deep	164–167
	Smell and Taste	168–173

MCAT 2015: Categories in Sensation and Perception	SGWNJ, <i>Psychology</i> , Third Canadian Edition, Correlations	
Content Category 6A: Sensing the environment	Section Title	Page Number(s)
<b>Vision</b>	Vision I and Vision II	135–155
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## About the Canadian Edition

In writing the Canadian edition, we retained all the unique features of the first American edition textbook, and included the essential and updated coverage of the third American edition. Building on this third edition, our goal was to create a textbook that would engage Canadian students by situating the content in Canadian and international contexts, replacing American examples with those of relevance for both Canadian and other international students. This is why we call it the third Canadian edition. Current Canadian and international data replace American data and statistics where appropriate. We highlight the remarkable scientific accomplishments of Canadian scientists in psychology and neuropsychology, drawing upon Canadian issues. Finally, we have included photographs and figures that reflect the Canadian context and Canadian research.

To illustrate how we have incorporated a Canadian perspective, we highlight some of the specific information included across different chapters.

► In our introductory chapter on the evolution of psychology (Chapter 1), we discuss the development of the field in Canada, highlighting Canadian pioneers, such as James Mark Baldwin, Donald Olding Hebb, Brenda Milner, and Wilder Penfield. Besides the American Psychological Association, we include

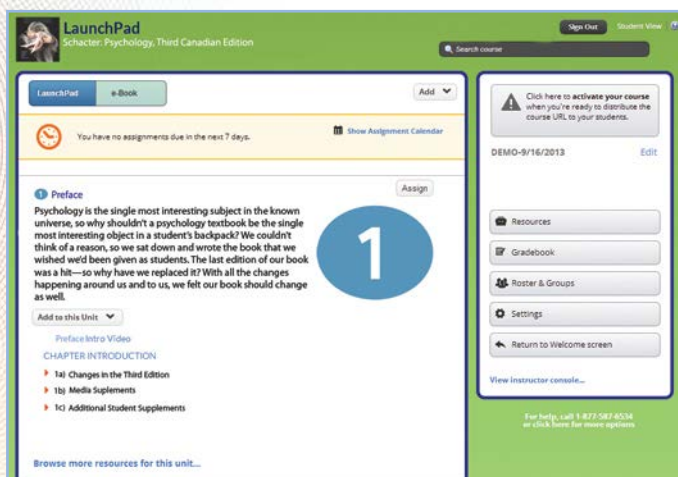
descriptions of other Canadian psychological organizations, such as the Canadian Psychological Association, the Canadian Society for Brain, Behaviour and Cognitive Science, and the Canadian Association of Neuroscience.

- In the chapter on research methods (Chapter 2), we include greater details on the fundamentals of conducting research and data evaluation, using Canadian data in our explanations. Most importantly, we include TriCouncil ethical guidelines, and the Canadian Psychological Association code of ethics that all Canadian psychologists are to follow whether in conducting research or dealing with clients.
- When discussing neuroscience and behaviour (Chapter 3), we start with relevant Canadian examples to illustrate the issue of sports-related head trauma and chronic traumatic encephalopathy. We also highlight the contributions of internationally renowned neurosurgeon Wilder Penfield in mapping the somatosensory and motor cortex. McGill researcher Michael Meaney's work demonstrating that maternal caretaking behaviour has a profound influence on the stress response in offspring is profiled in the Hot Science box.
- In Sensation and Perception (Chapter 4), we highlight research from the University of Western Ontario on the neural pathways for vision or visual streams. We also describe University of Toronto researcher Glenn Schellenberg's study on the link between music education and IQ scores.
- In the chapter on consciousness (Chapter 5), we highlight a case study by researchers at the University of Western Ontario who use fMRI technology to determine the level of consciousness in brain-damaged patients with disorders of consciousness.
- In Memory (Chapter 6), we cover the seminal research on levels of processing by Fergus Craik and Endel Tulving, from University of Toronto, which has been so influential in our understanding of how humans encode information. In this chapter, we discuss Brenda Milner's discovery, through her early work with Henry Molaison (H.M.), of the role of the hippocampus in long-term memory.
- In the chapter on Learning (Chapter 7), we discuss some of McMaster University researcher Shepard Siegel's work on classical conditioning and how it can be used to explain how drug overdoses occur with experienced drug abusers. We also describe research at McGill University with rats that demonstrates how operant conditioning occurs.
- In Emotion and Motivation (Chapter 8), we discuss the issue of eating disorders from a Canadian perspective and the research of University of British Columbia researcher Stephen Porter on lie detection.
- In the chapter on language and thought (Chapter 9), we discuss the future of bilingualism in Canada.
- In the chapter on intelligence (Chapter 10), we use athleticism as a model for intelligence, and Canadian hockey player, Hayley Wickenheiser, as an example. By examining Wickenheiser's athletic abilities we question how intelligence is measured and thus discuss in detail intelligence testing and measurement methods. We also describe the work of University of British Columbia researcher Mark Holder on emotional intelligence.
- In Development (Chapter 11), we highlight Canadian statistics on health-related issues. McGill University research sheds light on the relationship between reflexes and motor development. We describe work by Canadian researcher Tomáš Paus that show how areas of the brain develop with age.
- The chapter on personality (Chapter 12) describes a study by University of British Columbia researchers on personality, language, and behaviour.

- Social Psychology (Chapter 13) includes research on the frustration-aggression hypothesis by University Calgary researchers. We also discuss the research conducted at McGill University on attraction and relationship maintenance.
- Stress and Health (Chapter 14) includes a study on Canadian immigration and health patterns, and statistics relating to health issues.
- In the chapter on psychological disorders (Chapter 15), we look at the incidence rates of psychological disorders in Canada. We also look at alternative disorder evaluation protocols.
- In Treatment of Psychological Disorders (Chapter 16), we examine treatment rates and strategies available to Canadians and the ethics code for the treatment of patients.

## Media and Supplements

### LaunchPad with LearningCurve Quizzing



#### A comprehensive web resource for teaching and learning psychology

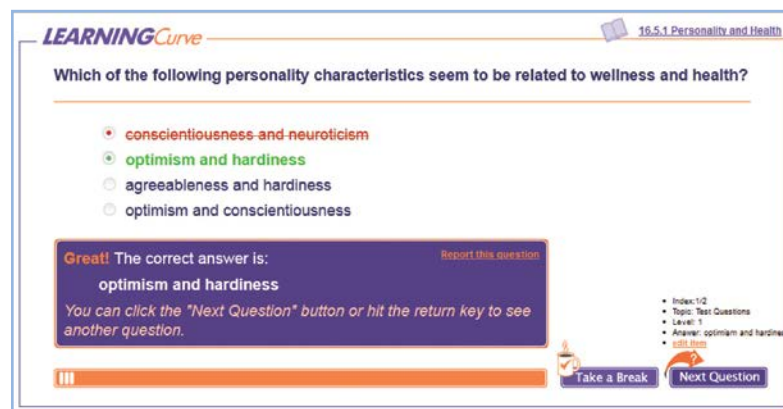
LaunchPad combines Worth Publishers' award-winning media with an innovative platform for easy navigation. For students, it is the ultimate online study guide, with rich interactive tutorials and videos, as well as an e-Book and the LearningCurve adaptive quizzing system. For instructors, LaunchPad is a full course space where class documents can be posted, quizzes are easily assigned and graded, and students' progress can be assessed and recorded. Whether you are looking for the most effective study tools or a robust platform for an online course, LaunchPad is a powerful way to enhance your class.

LaunchPad for *Psychology*, Third Canadian Edition, includes all the following resources:

LaunchPad to Accompany *Psychology*, Third Canadian Edition, can be previewed and purchased at <http://www.worthpublishers.com/launchpad/schacter3ecanadian>.

*Psychology*, Third Canadian Edition, and LaunchPad can be ordered together with ISBN-10: 1-4641-9363-0 / ISBN-13: 978-1-4641-9363-7.

- The design of the **LearningCurve** quizzing system is based on the latest findings from learning and memory research. It combines adaptive question selection, immediate and valuable feedback, and a gamelike interface to engage students in a learning experience that is unique to them. Each LearningCurve quiz is fully integrated with other resources in LaunchPad through the Personalized Study Plan, so students will be able to review using Worth's extensive library of videos and activities. And state-of-the-art question analysis reports allow instructors to track the progress of individual students as well as their class as a whole.



- **New! Data Visualization Exercises** offer students practice in understanding and reasoning about data. In each activity, students interact with a graph or visual display of data and must think like a scientist to answer the accompanying questions. These activities build quantitative reasoning skills and offer a deeper understanding of how science works.
- **An interactive e-Book** allows students to highlight, bookmark, and scribble in their own notes on the e-Book page, just as they would with a printed textbook. Google-style searching and in-text glossary definitions make the text ready for the digital age.
- **Student Video Activities** include more than 100 engaging video modules that instructors can easily assign and customize for student assessment. Videos cover classic experiments, current news footage, and cutting-edge research, all of which are sure to spark discussion and encourage critical thinking.
- **PsychInvestigator: Laboratory Learning in Introductory Psychology** is a series of activities that model a virtual laboratory and are produced in association with Arthur Kohn, Ph.D., of Dark Blue Morning Productions. Students are introduced to core psychological concepts by a video host and then participate in activities that generate real data and lead to some startling conclusions! Like all activities in LaunchPad, PsychInvestigator activities can be assigned and automatically graded.
- The award-winning tutorials in Tom Ludwig's (Hope College) **PsychSim 5.0** and **Concepts in Action** provide an interactive, step-by-step introduction to key psychological concepts.
- **The Scientific American Newsfeed** delivers weekly articles, podcasts, and news briefs on the very latest developments in psychology from the first name in popular science journalism.



## Additional Student Supplements

- The **CourseSmart e-Book** offers the complete text of *Psychology*, Third Canadian Edition, in an easy-to-use format. Students can choose either to purchase the CourseSmart e-Book as an online subscription or to download it to a personal computer or a portable media player, such as a smart phone or iPad. The CourseSmart e-Book for *Psychology*, Third Canadian Edition, can be pre-viewed and purchased at [www.coursesmart.com](http://www.coursesmart.com).
- **Pursuing Human Strengths: A Positive Psychology Guide** by Martin Bolt of Calvin College is a perfect way to introduce students to both the amazing field of positive psychology as well as their own personal strengths.
- **The Critical Thinking Companion for Introductory Psychology**, by Jane S. Halonen of the University of West Florida and Cynthia Gray of Beloit College, contains both a guide to critical thinking strategies as well as exercises in pattern recognition, practical problem solving, creative problem solving, scientific problem solving, psychological reasoning, and perspective-taking.
- Worth Publishers is proud to offer several readers of articles taken from the pages of *Scientific American*. Drawing on award-winning science journalism, the **Scientific American Reader to Accompany Psychology, Third Edition**, by Daniel L.

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**Schacter, Daniel T. Gilbert, Daniel M. Wegner, and Matthew K. Nock** features pioneering and cutting-edge research across the fields of psychology. Selected by the authors themselves, this collection provides further insight into the fields of psychology through articles written for a popular audience. These articles are available for the Third Canadian Edition.

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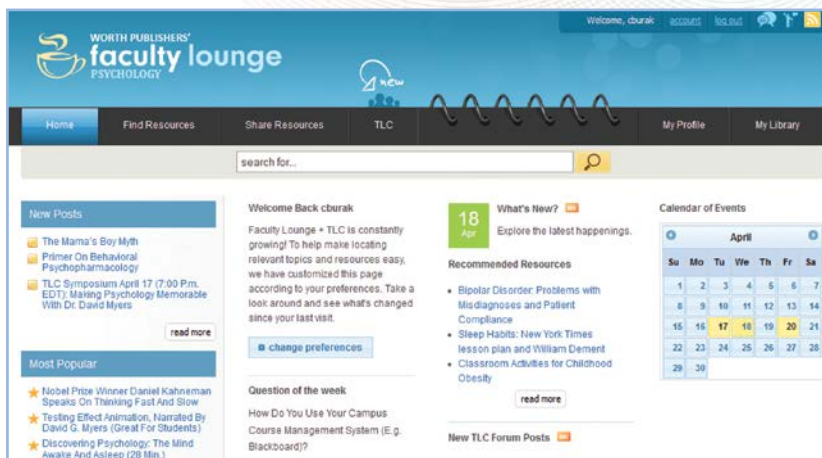
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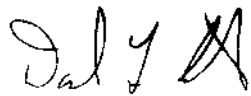
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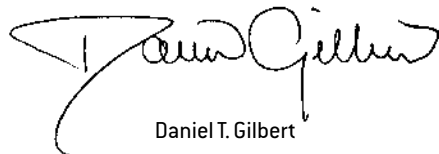
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Daniel L. Schacter



Daniel T. Gilbert



Matthew K. Nock



Ingrid S. Johnsrude



# Psychology: Evolution of a Science

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### ▲ The Profession of Psychology: Past and Present

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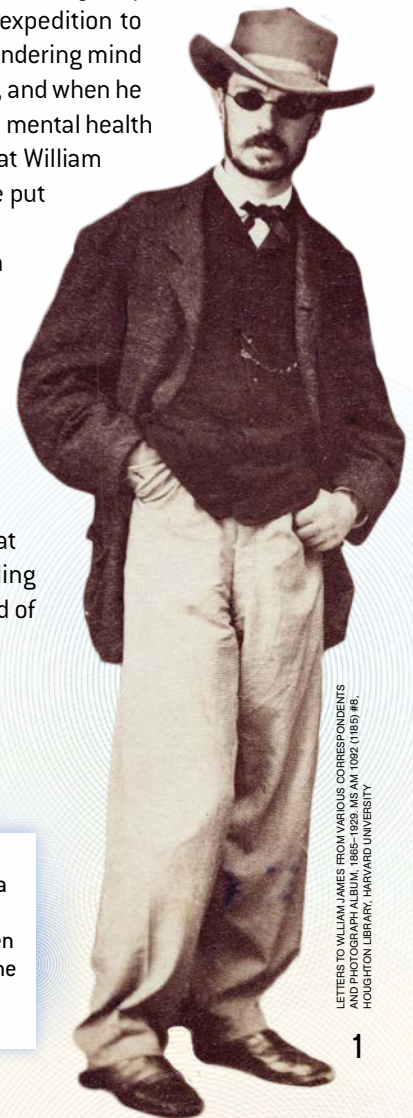
What Psychologists Do: Research Careers

## HOT SCIENCE Psychology as a Hub Science

**A** LOT WAS HAPPENING IN 1860. In the United Province of Canada, the cornerstone of the Canadian Parliament buildings was laid in Ottawa, and the Cariboo gold rush was about to begin in British Columbia. In the United States Abraham Lincoln had just been elected president and a woman named Anne Kellogg had just given birth to a child who would one day grow up to invent the cornflake. But none of this mattered very much to William James, a bright, taciturn, 18-year-old who had no idea what to do with his life. He loved to paint and draw, but worried that he was not talented enough to become a serious artist. He had enjoyed studying biology in school but doubted that a naturalist's salary would ever allow him to get married and have a family of his own. So, like many young people who are faced with difficult decisions about their futures, William abandoned his dreams and chose to do something in which he had little interest but of which his family heartily approved. Alas, within a few months of arriving at Harvard Medical School, his lack of interest in medicine blossomed into a troubling lack of enthusiasm, and so with a bit of encouragement from the faculty, he put his medical studies on hold to join a biological expedition to the Amazon. The adventure failed to focus his wandering mind (although he learned a great deal about leeches), and when he returned to medical school, both his physical and mental health began to deteriorate. It was clear to everyone that William James was not the sort of person who should be put in charge of a scalpel and a bag of drugs.

Had James become an artist, a biologist, or a physician, we would probably remember nothing about him today. Fortunately for us, he was a deeply confused young man who could speak five languages, and when he became so depressed that he was once again forced to leave medical school, he decided to travel around Europe, where at least he knew how to talk to people. He spent much of his time in what is now Germany, which at that time was a leading centre for scientific enquiry, especially in the field of

Throughout his youth, William James (1842–1910) seemed seriously mixed up. He began university as a chemistry major, then switched to anatomy, then set sail on a biological expedition to the Amazon, and then travelled to Europe, where he became interested in the new science of psychology. Luckily for us, he stuck with it for a while.



LETTERS TO WILLIAM JAMES FROM VARIOUS CORRESPONDENTS AND ANSWERS, 1862–1863, HARVARD UNIVERSITY HUGHTON LIBRARY, HARVARD UNIVERSITY

physiology. As he talked and listened, he learned about a new science called *psychology* (from a combination of the Greek *psyche* [soul] and *logos* [to study]). He saw that this developing field, in which physiology, medicine, and philosophy merged, was taking a modern, scientific approach to age-old questions about human nature. Such questions had become painfully familiar to him during his personal search for meaning, but only poets and philosophers had ever before offered answers to them (Bjork, 1983; Simon, 1998). Excited about the new discipline, James returned to America and quickly finished his medical degree. But he never practised medicine and never intended to do so. Rather, he became a professor at Harvard University and devoted the rest of his life to psychology. His landmark book, *The Principles of Psychology*, is still widely read and remains one of the most influential books ever written on the subject (James, 1890).

**A LOT HAS HAPPENED SINCE THEN.** Abraham Lincoln has become the subject of an Oscar award-winning film, the gold rush has been replaced in the West by the oil sands development, and the Kellogg Company sells about \$9 billion worth of cornflakes every year. If William James (1842–1910) were alive today, he would be amazed by all of these things. But he would probably be even more amazed by the intellectual advances that have taken place in the science that he helped create.

**P** *psychology is the scientific study of mind and behaviour.* The **mind** refers to *the private inner experience of perceptions, thoughts, memories, and feelings, an ever-flowing stream of consciousness.* **Behaviour** refers to *observable actions of human beings and nonhuman animals, the things that we do in the world, by ourselves or with others.* As you will see in the chapters to come, psychology is an attempt to use scientific methods to address fundamental questions about mind and behaviour that have puzzled people for millennia. The answers to these questions would have astonished William James. Let us take a look at three key examples:

1. *What are the bases of perceptions, thoughts, memories, and feelings, or our subjective sense of self?*

For thousands of years, philosophers tried to understand how the objective, physical world of the body was related to the subjective, psychological world of the mind. Today, psychologists know that all of our subjective experiences arise from the electrical and chemical activities of our brains. As you will see throughout this book, some of the most exciting developments in psychological research focus on how our perceptions, thoughts, memories, and feelings are related to activity in the brain. Psychologists and neuroscientists are using new technologies to explore this relationship in ways that would have seemed like science fiction only 20 years ago.

For example, the technique known as *functional magnetic resonance imaging* (fMRI) allows scientists to scan a brain to determine which parts are active when a person reads a word, sees a face, learns a new skill, or remembers a personal experience. In one study, the brains of both professional and novice pianists were scanned as they made complex finger movements, like those involved in piano playing. The results showed that professional pianists have *less* activity than novices in the parts of the brain that guide these finger movements (Krings et al., 2000). This suggests that extensive practice at the piano changes the brains of professional pianists and that the regions controlling finger movements operate more efficiently for them than they do for novices. You will learn more about this in the Memory and Learning chapters and see in the coming chapters how studies using fMRI and related techniques are transforming many different areas of psychology.



DAVID COOPER/TORONTO STAR VIA GETTY IMAGES

Montreal-born Oscar Peterson (1925–2007) is considered to be one of the greatest jazz pianists of all time. His career spanned more than 60 years. Compared to those of a novice piano player, the brain regions that controlled Oscar's fingers were relatively *less* active when he played.

## 2. How does the mind usually allow us to function effectively in the world?

Scientists sometimes say that form follows function; that is, if we want to understand *how* something works (e.g., an engine or a thermometer), we need to know what it is working *for* (e.g., powering vehicles or measuring temperature). As William James often noted, “Thinking is for doing,” and the function of the mind is to help us do those things that sophisticated animals have to do in order to prosper, such as acquire food, shelter, and mates. Psychological processes are said to be *adaptive*, which means that they promote the welfare and reproduction of organisms that engage in those processes. Perception allows us to recognize our families, see predators before they see us, and avoid stumbling into oncoming traffic. Language allows us to organize our thoughts and communicate them to others, which enables us to form social groups and cooperate. Memory allows us to avoid solving the same problems over again every time we encounter them and to keep in mind what we are doing and why. Emotions allow us to react quickly to events that have life or death significance, and they enable us to form strong social bonds. The list goes on and on.

Given the adaptiveness of psychological processes, it is not surprising that people with deficiencies in these processes often have a pretty tough time. The neurologist Antonio Damasio (1994) described the case of Elliot, a middle-aged husband and father with a good job, whose life was forever changed when surgeons discovered a tumour in the middle of his brain. The surgeons were able to remove the tumour and save his life, and for a while Elliot seemed just fine. But then odd things began to happen. At first, Elliot seemed more likely than usual to make bad decisions (when he could make decisions at all), and as time went on, his bad decisions became truly dreadful ones. He could not prioritize tasks at work because he could not decide what to do first, and when he did, he got it wrong. Eventually he was fired, so he pursued a series of risky business ventures—all of which failed—and he lost his life’s savings. His wife divorced him, he married again, and his second wife divorced him too.

So what ruined Elliot’s life? The neurologists who tested Elliot were unable to detect any decrease in his cognitive functioning. His intelligence was intact, and his ability to speak, think, and solve logical problems was every bit as sharp as it ever was. But as they probed further, they made a startling discovery: Elliot was no longer able to experience emotions. For example, Elliot did not experience any regret or anger when his boss gave him the pink slip and showed him the door, he did not experience anxiety when he poured his entire bank account into a foolish business venture, and he did not experience any sorrow when his wives packed up and left him. Most of us have wished from time to time that we could be as stoic and unflappable as that; after all, who needs anxiety, sorrow, regret, and anger? The answer is that we all do.

## 3. Why does the mind occasionally function so ineffectively in the world?

The mind is an amazing machine that can do a great many things quickly. We can drive a car while talking to a passenger while recognizing the street address while remembering the name of the song that just came on the radio. But like all machines, the mind often trades accuracy for speed and versatility. This can produce “bugs” in the system, causing occasional malfunctions in our otherwise efficient mental processing. One of the most fascinating aspects of psychology is that we are *all* prone to a variety of errors and illusions. Indeed, if thoughts, feelings, and actions were error free, then human behaviour would be orderly, predictable, and dull, which it clearly is not. Rather, it is endlessly surprising, and its surprises often derive from our ability to do precisely the wrong thing at the wrong time.



CEBZOB/WEIN.COM/NEWS.COM

Emotions are adaptive. For example, fear leads many animals to freeze so that their enemies cannot see them—as it did to these young women who were touring a “haunted house” in Niagara Falls.

### psychology

The scientific study of mind and behaviour.

### mind

The private inner experience of perceptions, thoughts, memories, and feelings.

### behaviour

Observable actions of human beings and nonhuman animals.

Consider a few examples from diaries of people who took part in a study concerning mental errors in everyday life (Reason & Mycielska, 1982, pp. 70–73):

- I meant to get my car out, but as I passed the back porch on my way to the garage, I stopped to put on my boots and gardening jacket as if to work in the yard.
- I put some money into a machine to get a stamp. When the stamp appeared, I took it and said, “Thank you.”
- On leaving the room to go to the kitchen, I turned the light off, although several people were there.

If these lapses seem amusing, it is because, in fact, they are. But they are also potentially important as clues to human nature. For example, notice that the person who bought a stamp said, “Thank you,” to the machine and not, “How do I find the subway?” In other words, the person did not just do *any* wrong thing; rather, he did something that would have been perfectly correct in a real social interaction. As each of these examples suggests, people often operate on “autopilot,” or behave automatically, relying on well-learned habits that they execute without really thinking. When we are not actively focused on what we are saying or doing, these habits may be triggered inappropriately. William James (1890) thought that the influence of habit could help explain the seemingly bizarre actions of “absent-minded” people: “Very absent-minded persons,” he wrote in *The Principles of Psychology*, “on going into their

## THE REAL WORLD

### The Perils of Procrastination

William James understood that the human mind and behaviour are fascinating in part because they are not error free. The mind’s mistakes interest us primarily as paths to achieving a better understanding of mental activity and behaviour, but they also have practical consequences. Let us consider a malfunction that can have significant consequences in your own life: procrastination.

At one time or another, most of us have avoided carrying out a task or put it off to a later time. The task may be unpleasant, difficult, or just less entertaining than other things we could be doing at the moment. For university students, procrastination can affect a range of academic activities, such as writing an essay or preparing for a test. Academic procrastination is not uncommon: Over 70 percent of university students report that they engage in some form of procrastination (Schouwenburg, 1995). Although it is fun to hang out with your friends tonight, it is not so much fun to worry for 3 days about your impending history exam or try to study at 4:00 a.m. the day of the test. Studying now, or at least a little bit each day, robs procrastination of its power over you.

Some procrastinators defend the practice by claiming that they tend to work best

under pressure or by noting that as long as a task gets done, it does not matter all that much if it is completed just before the deadline. Is there any merit to such claims, or are they just feeble excuses for counterproductive behaviour?

A study of 60 undergraduate psychology students provided some intriguing answers (Tice & Baumeister, 1997). At the beginning of the semester, the instructor announced a due date for a final essay and told students that if they could not meet the date, they would receive an extension to a later date. About a month later, students completed a scale that measures tendencies toward

procrastination. At that same time, and then again during the last week of class, students recorded health symptoms they had experienced during the past week, the amount of stress they had experienced during that week, and the number of visits they had made to a health care centre during the previous month.

Students who scored high on the procrastination scale tended to turn in their papers late. One month into the semester, these procrastinators reported less stress and fewer symptoms of physical illness than did nonprocrastinators. But at the end of the semester, the procrastinators reported more stress and more health symptoms than did the nonprocrastinators, and also reported more visits to the health centre. The procrastinators also received lower grades on their essays and on course exams. More recent studies have found that higher levels of procrastination are associated with poorer academic performance (Moon & Illingworth, 2005) and higher levels of psychological distress (Rice, Richardson, & Clark, 2012). Therefore, in addition to making use of the tips provided in The Real World box on increasing study skills (pp. 10–11), it would seem wise to avoid procrastination in this course and others.





bedroom to dress for dinner have been known to take off one garment after another and finally get into bed” (p. 115).

James understood that the mind's mistakes are as instructive as they are intriguing, and modern psychology has found it quite useful to study them. Things that are whole and unbroken hum along nicely and do their jobs while leaving no clue about how they do them. Cars gliding down the expressway might as well be magic carpets as long as they are working properly because we have no idea what kind of magic is moving them along. It is only when automobiles break down that we learn about their engines, water pumps, and other fine pieces and processes that normally work together to produce the ride. Breakdowns and errors are not just about destruction and failure, they are pathways to knowledge. (See The Real World box for an example common to us all: procrastination.) In the same way, understanding lapses, errors, mistakes, and the occasionally puzzling nature of human behaviour provides a vantage point for understanding the normal operation of mental life and behaviour. The story of Elliot, whose behaviour broke down after he had brain surgery, is an example that highlights the role that emotions play in guiding normal judgment and behaviour.

Psychology is exciting because it addresses fundamental questions about human experience and behaviour, and the three questions we have just considered are merely the tip of the iceberg. Think of this book as a guide to exploring the rest of the iceberg. But before we don our parkas and grab our pick axes, we need to understand how the iceberg got here in the first place. To understand psychology in the twenty-first century, we need to become familiar with the psychology of the past.

## Psychology's Roots: The Path to a Science of Mind

When the young William James interrupted his medical studies to travel in Europe during the late 1860s, he wanted to learn about human nature. But he confronted a very different situation than a similarly curious student would confront today, largely because psychology did not yet exist as an independent field of study. As James cheekily wrote, “The first lecture in psychology that I ever heard was the first I ever gave” (quoted in Perry, 1996, p. 228). Of course, that does not mean no one had ever thought about human nature before. For 2000 years, thinkers with scraggly beards and poor dental hygiene had pondered such questions and, in fact, modern psychology acknowledges its deep roots in philosophy. We will begin by examining those roots and then describe some of the early attempts to develop a scientific approach to psychology by relating the mind to the brain. Next, we will see how psychologists divided into different camps (or schools of thought): *Structuralists* tried to analyze the mind by breaking it down into its basic components, and *functionalists* focused on how mental abilities allow people to adapt to their environments.

### Psychology's Ancestors: The Great Philosophers

The desire to understand ourselves is not new. Greek thinkers such as Plato (428 BCE–347 BCE) and Aristotle (384 BCE–322 BCE) were among the first to struggle with fundamental questions about how the mind works (Robinson, 1995). Greek philosophers debated many of the questions that psychologists continue to debate today. For example, are cognitive



AP PHOTO/KALAMAZOO GAZETTE/JILL MCLANE BAKER

Mistakes can teach us a lot about how people think ... or fail to think, as the case may be.

How do young children learn about the world? Plato believed that certain kinds of knowledge are innate, whereas Aristotle believed that the mind is a blank slate on which experiences are written.



GEO MARTINEZ/FEATURE PICS

**nativism**

The philosophical view that certain kinds of knowledge are innate or inborn.

**philosophical empiricism**

The view that all knowledge is acquired through experience.

**phrenology**

A now defunct theory that specific mental abilities and characteristics, ranging from memory to the capacity for happiness, are localized in specific regions of the brain.

abilities and knowledge inborn, or are they acquired only through experience? Plato argued in favour of **nativism**, *the philosophical view that certain kinds of knowledge are innate or inborn*. Children in every culture figure out early on that sounds can have meanings that can be arranged into words, which then can be arranged into sentences. Before a child is old enough to poop in the proper place, he or she has already mastered the fundamentals of language without any formal instruction. Is the propensity to learn language “hardwired” (something that children are born with)? Or does the ability to learn language depend on the child’s experience? Aristotle believed that the child’s mind was a *tabula rasa* (blank slate) on which experiences were written, and he argued for **philosophical empiricism**, *the view that all knowledge is acquired through experience*.

Although few, if any, modern psychologists believe that nativism or empiricism is entirely correct, the issue of just how much “nature” and “nurture” explain any given behaviour is still a matter of controversy. In some ways, it is quite amazing that ancient philosophers were able to articulate so many of the important questions in psychology and offer many excellent insights into their answers without any access to scientific evidence. Their ideas came from personal observations, intuition, and speculation. Although they were quite good at arguing with one another, they usually found it impossible to settle their disputes because their approach provided no means of testing their theories. As you will see in the Methods chapter, the ability to test a theory is the cornerstone of the scientific approach and the basis for reaching conclusions in modern psychology.



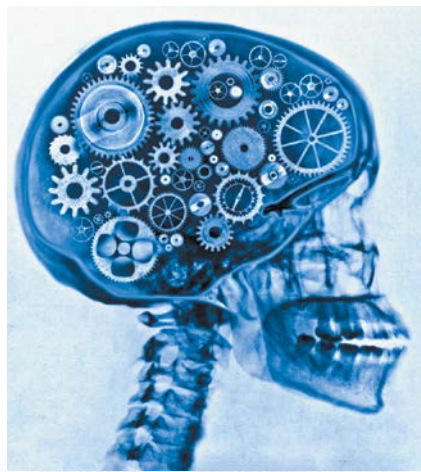
**What fundamental question has puzzled philosophers for millennia?**

## From the Brain to the Mind: The French Connection

We all know that the brain and the body are physical objects that we can see and touch and that the subjective contents of our minds—our perceptions, thoughts, and feelings—are not. Inner experience is perfectly real, but where in the world is it? French philosopher René Descartes (1596–1650) argued that body and mind are fundamentally different things—that the body is made of a material substance, whereas the mind (or soul) is made of an immaterial or spiritual substance. But if the mind and the body are different things made of different substances, then how do they interact? How does the mind tell the body to put its foot forward, and when the body steps on a rusty nail, why does the mind say “ouch”? This is the problem of *dualism*, or how mental activity can be reconciled and coordinated with physical behaviour.

Descartes suggested that the mind influences the body through a tiny structure near the bottom of the brain known as the pineal gland. He was largely alone in this view because other philosophers at the time either rejected his explanation or offered alternative ideas. For example, British philosopher Thomas Hobbes (1588–1679) argued that the mind and body are not different things at all; rather, the mind *is* what the brain *does*. From Hobbes’s perspective, looking for a place in the brain where the mind meets the body is like looking for the place in a television where the picture meets the flat panel display.

The German physician Franz Joseph Gall (1758–1828) also thought that brains and minds were linked, but by size rather than by glands. He examined the brains of animals and of people who had died of disease, or as healthy adults, or as children, and observed that mental ability often increases with larger brain size and decreases with damage to the brain. These aspects of Gall’s findings were generally accepted (and the part about brain damage still is today). But Gall went far beyond his evidence to develop a psychological theory known as **phrenology**, *a now defunct theory that specific mental abilities and characteristics, ranging from memory to the capacity*



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René Descartes believed that the physical body was a container for the non-physical thing called the mind. Centuries later, the philosopher Gilbert Ryle (1949) argued that Descartes was wrong, that there is no “ghost in the machine,” and that all mental activity is simply the result of the physical activity of the brain. Most modern scientists reject Descartes’s “dualism” and embrace Ryle’s “scientific materialism.”



**What were early explanations for dualism?**

for happiness, are localized in specific regions of the brain (see **FIGURE 1.1**). The idea that different parts of the brain are specialized for specific psychological functions turned out to be right; as you will learn later in the book, a part of the brain called the *hippocampus* is intimately involved in memory, just as a structure called the *amygdala* is intimately involved in fear. But phrenology took this idea to an absurd extreme. Gall asserted that the size of bumps or indentations on the skull reflected the size of the brain regions beneath them and that by feeling those bumps, one could tell whether a person was friendly, cautious, assertive, idealistic, and so on. What Gall did not realize was that bumps on the skull do not necessarily reveal anything about the shape of the brain underneath.

Phrenology made for a nice parlour game and gave young people a good excuse for touching each other, but in the end it amounted to a series of strong claims based on weak evidence. Not surprisingly, his critics were galled (so to speak), and they ridiculed many of his proposals. Despite an initially large following, phrenology was quickly discredited (Fancher, 1979).

While Gall was busy playing bumpologist, French scientists were beginning to link the brain and the mind in a more convincing manner. Biologist Marie Jean Pierre Flourens (1794–1867) was appalled by Gall's far-reaching claims and sloppy methods, so he conducted experiments in which he surgically removed specific parts of the brain from dogs, birds, and other animals and found (not surprisingly!) that their actions and movements differed from those of animals with intact brains.

French surgeon Pierre Paul Broca (1824–1880) worked with a patient who had suffered damage to a small part of the left side of the brain (now known as *Broca's area*). The patient, Monsieur Leborgne, was virtually unable to speak and could utter only the single syllable “tan.” Yet the patient understood everything that was said to him and was able to communicate using gestures. Broca had the crucial insight that damage to a specific part of the brain impaired a specific mental function,

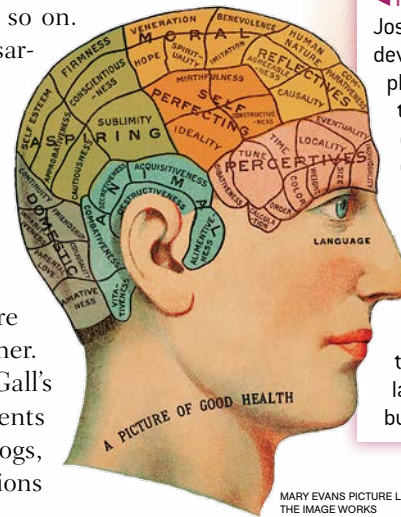
clearly demonstrating that the brain and mind are closely linked. This was important in the nineteenth century because at that time many people accepted Descartes's idea that the mind is separate from, but interacts with, the brain and the body. Broca and Flourens, then, were the first to demonstrate that the mind is grounded in a material substance, namely, the brain. Their work jump-started the scientific investigation of mental processes.

**How did work involving patients with brain damage help demonstrate the mind–brain connection?**

French surgeon Pierre Paul Broca (1824–1880) worked with a patient who had suffered damage to a small part of the left side of the brain (now known as *Broca's area*). The patient, Monsieur Leborgne, was virtually unable to speak and could utter only the single syllable “tan.” Yet the patient understood everything that was said to him and was able to communicate using gestures. Broca had the crucial insight that damage to a specific part of the brain impaired a specific mental function,

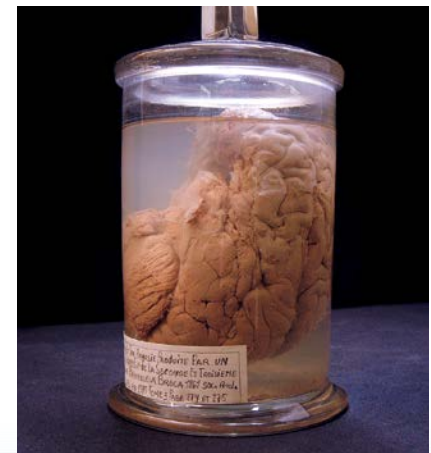
## Structuralism: Applying Methods from Physiology to Psychology

Another birthplace of psychology was Germany. In the middle of the nineteenth century, German scientists who were trained in the field of **physiology**, *the study of biological processes, especially in the human body*, were making discoveries fundamental to the new field of psychology. Physiologists had developed methods that allowed them to measure such things as the speed of nerve impulses, and some of them had begun to use these methods to measure mental abilities. William James was drawn to the work of two such physiologists: Hermann von Helmholtz (1821–1894) and Wilhelm Wundt (1832–1920). “It seems to me that perhaps the time has come for psychology to begin to be a science,” wrote James in a letter written in 1867 during his visit to Berlin. “Helmholtz and a man called Wundt at Heidelberg are working at it.” What attracted James to the work of these two scientists?



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**◀ Figure 1.1 Phrenology** Franz Joseph Gall (1758–1828) developed a theory called phrenology, which suggested that psychological capacities (such as the capacity for friendship) and traits (such as cautiousness and mirth) were located in particular parts of the brain. The greater the number of these capacities and traits a person had, the larger the corresponding bumps on the skull.



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M. Leborgne was nicknamed “Tan” because it was the only word he could say. When he died in 1861, Paul Broca dissected his brain and found a lesion in the left hemisphere which, he concluded, had been responsible for Leborgne's loss of speech. Today, Leborgne's brain lives in a jar at the Musée Dupuytren in Paris, France. And to this day, no one knows his first name.

### physiology

The study of biological processes, especially in the human body.

## Helmholtz Measures the Speed of Responses

A brilliant experimenter with a background in both physiology and physics, Helmholtz had developed a method for measuring the speed of nerve impulses in a frog's leg, which he then adapted to the study of human beings. Helmholtz trained participants to respond when he applied a **stimulus**—*sensory input from the environment*—to different parts of the leg. He recorded his participants' **reaction time**, or *the amount of time taken to respond to a specific stimulus*, after applying the stimulus. Helmholtz found that people generally took longer to respond when their toe was stimulated than when their thigh was stimulated, and the difference between these reaction times

allowed him to estimate how long it took a nerve impulse to travel to the brain. These results were astonishing to nineteenth-century scientists because, at that time, just about everyone thought that mental processes occurred instantaneously. When you move your hands in front of your eyes, you do not feel your hands move a fraction of a second before you see them. The real world does not appear like one of those late-night movies in which the video and the audio are off by just a fraction of a second. Scientists assumed that the neurological processes underlying mental events *must* be instantaneous for everything to be so nicely synchronized, but Helmholtz showed that this was not true. In so doing, he also demonstrated that reaction time could be a useful way to study the mind and the brain. Helmholtz also made fundamental contributions to our understanding of colour vision and perception of sound.



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By measuring a person's reaction times to different stimuli, Hermann von Helmholtz (1821–1894) estimated the length of time it takes a nerve impulse to travel to the brain.



What was the useful application of Helmholtz's results?

## Wundt and the Development of Structuralism

Although Helmholtz's contributions were important, historians generally credit the official emergence of psychology to Helmholtz's research assistant, Wilhelm Wundt (1832–1920) (Rieber, 1980). In 1867, at the University of Heidelberg, Wundt taught what was probably the first course in physiological psychology, which led to the publication of his book, *Principles of Physiological Psychology*, in 1874. Wundt called the book “an attempt to mark out [psychology] as a new domain of science” (Fancher, 1979, p. 126). In 1879, at the University of Leipzig, Wundt opened the first laboratory exclusively devoted to psychological studies, and this event marked the official birth of psychology as an independent field of study. The new lab was full of graduate students carrying out research on topics assigned by Wundt, and it soon attracted young scholars from all over the world who were eager to learn about the new science that Wundt had developed.

Wundt believed that scientific psychology should focus on analyzing **consciousness**, *a person's subjective experience of the world and the mind*. Consciousness encompasses a broad range of subjective experiences. We may be conscious of sights, sounds, tastes, smells, bodily sensations, thoughts, or feelings. As Wundt tried to figure out a way to study consciousness scientifically, he noted that chemists try to understand the structure of matter by breaking down natural substances into basic elements. So he and his students adopted an approach called **structuralism**, *the analysis of the basic elements that constitute the mind*. This approach involved breaking down consciousness into elemental sensations and feelings, and you can do a bit of structuralism right now without leaving your chair.

Consider the contents of your own consciousness. At this very moment you may be aware of the meaning of these words, the visual appearance of the letters on the page, the key ring pressing uncomfortably against your thigh, your feelings of excitement or boredom (probably excitement), the smell of curried chicken salad, or the nagging

### stimulus

Sensory input from the environment.

### reaction time

The amount of time taken to respond to a specific stimulus.

### consciousness

A person's subjective experience of the world and the mind.

### structuralism

The analysis of the basic elements that constitute the mind.

### introspection

The subjective observation of one's own experience.



How did the work of chemists influence early psychology?

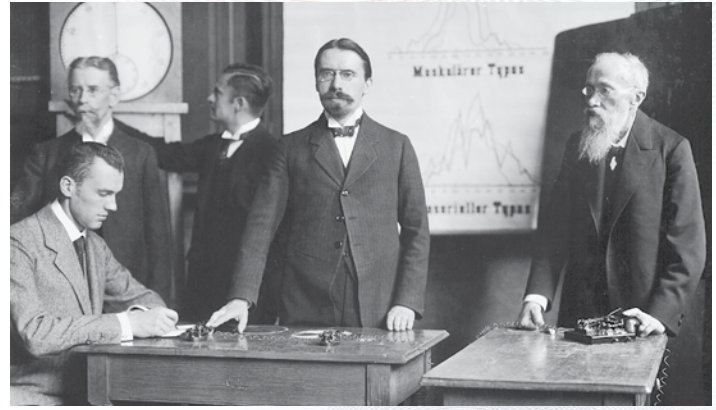
question of whether the War of 1812 really deserves its own overture. At any given moment, all sorts of things are swimming in the stream of consciousness, and Wundt tried to analyze them in a systematic way using the method of **introspection**, *the subjective observation of one's own experience*. In a typical experiment, observers (usually students) were presented with a stimulus (usually a colour or a sound) and then asked to report their introspections. The observers described the brightness of a colour or the loudness of a tone. They reported on their “raw” sensory experience, rather than on their interpretations of that experience. For example, an observer presented with this page would not report seeing words on the page (which counts as an interpretation of the experience), but instead might describe a series of black marks, some straight and others curved, against a bright white background. Wundt also attempted to carefully describe the feelings associated with elementary perceptions. For example, when Wundt listened to the clicks produced by a metronome, some of the patterns of sounds were more pleasant than others. By analyzing the relation between feelings and perceptual sensations, Wundt and his students hoped to uncover the basic structure of conscious experience.

Wundt tried to provide objective measurements of conscious processes by using reaction time techniques similar to those first developed by Helmholtz. Wundt used reaction times to examine a distinction between the perception and interpretation of a stimulus. His research participants were instructed to press a button as soon as a tone sounded. Some participants were told to concentrate on perceiving the tone before pressing the button, whereas others were told to concentrate only on pressing the button. Those people who concentrated on the tone responded about one tenth of a second more slowly than those told to concentrate only on pressing the button. Wundt reasoned that both fast and slow participants had to register the tone in consciousness (perception), but only the slower participants also had to interpret the significance of the tone and press the button. The faster research participants, focusing only on the response they were to make, could respond automatically to the tone because they did not have to engage in the additional step of interpretation (Fancher, 1979). This type of experimentation broke new ground by showing that psychologists could use scientific techniques to disentangle even subtle conscious processes. In fact, as you will see in later chapters, reaction time procedures have proven extremely useful in modern research.

## Titchener Brings Structuralism to the United States

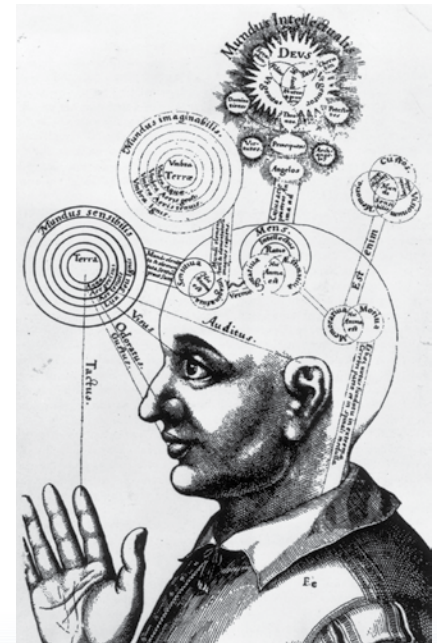
The pioneering efforts of Wundt's laboratory launched psychology as an independent science and profoundly influenced the field for the remainder of the nineteenth century. Many European and American scholars journeyed to Leipzig to study with Wundt. Among the most eminent was British-born Edward Titchener (1867–1927), who studied with Wundt for 2 years in the early 1890s. Titchener then moved to the United States and set up a psychology laboratory at Cornell University (where, if you would like to see it, his brain is still on display in the psychology department). Titchener brought some parts of Wundt's approach to America, but he also made some changes (Brock, 1993; Rieber, 1980). For instance, whereas Wundt emphasized the relationship between elements of consciousness, Titchener focused on identifying the basic elements themselves, using introspection. In his textbook, *An Outline of Psychology* (1896), Titchener put forward a list of more than 44 000 elemental qualities of conscious experience, most of them visual (32 820) or auditory (11 600) (Schultz & Schultz, 1987).

The influence of the structuralist approach gradually faded, due mostly to the introspective method. Science requires replicable observations; we could never



ARCHIVES OF THE HISTORY OF AMERICAN PSYCHOLOGY

Wilhelm Wundt (1832–1920), far right, founded the first laboratory devoted exclusively to psychology at the University of Leipzig in Germany. He sought to understand consciousness by breaking it down into its basic parts, including individual sensations and feelings.



HULTON ARCHIVE/GETTY IMAGES

Titchener was not the first to try to identify the elements of conscious experience. As this drawing shows, seventeenth-century physician and artist Robert Fludd tried to do the same thing—and was about equally successful.