

**ADOPT THE NEW  
LEARNING 4.0 MINDSET  
AND CHANGE YOUR LIFE**

**UNSTOPPABLE**

**YOU**



**PATRICIA A. McLAGAN**

## More Praise for *Unstoppable You*

“*Unstoppable You* cracks the code on learning more effectively in the complex and fast-moving 21st century. It provides the formula for making learning a lifelong partner in achieving your dreams.”

—Walter McFarland  
Founder, Windmill Human Performance

“Patricia McLagan’s ability to take something apart and put it together in an exciting and understandable way brings each chapter to life. *Unstoppable You* is a must-have for anyone who wants to stay on the cutting edge. The possibilities for what you could do with these ideas are endless.”

—Beverly Kaye  
Founder, Career Systems International  
Author, *Love 'Em or Lose 'Em* and *Help Them Grow or Watch Them Go*

“Patricia McLagan says that the way the world works is changing—it’s more connected and complex—and that learning 4.0 is the upgrade for surviving and thriving in this nonstop world. She’s right. This book is not old stuff redone; it is new, brilliant, helpful thinking about learning.”

—Julie O’Mara  
Diversity and Inclusion Author and Consultant

“As a strong advocate of lifelong learning and the reality that the world is moving at a rapid pace, Patricia McLagan helps us navigate the learning landscape with pragmatic practices and tools to guide us through the age of connectivity.”

—Annette Clayton  
CEO and President, Schneider Electric North America

“Patricia McLagan has done a masterful job of merging the latest in brain science and neurolearning to provide a blueprint for developing a 4.0 learning mindset. I highly recommend *Unstoppable You* to anyone interested in becoming their own career advocate and a successful lifelong learner in today’s competitive and global landscape.”

—Kenneth Nowack  
Chief Research Officer, Envisia Learning  
Co-Author, *Clueless: Coaching People Who Just Don't Get It*

“The unstoppable Patricia McLagan offers life-changing learning advice and tools in this book for those who want to strengthen their self-managed learning muscle. She integrates research and opinions from other experts in a way that makes this book a must-have for business leaders and professionals, as well as any adult eager to redefine how learning can and does happen.”

—Martha Soehren  
Chief Talent Development Officer, Comcast Cable

“With *Unstoppable You*, Patricia McLagan focuses on making us all successful in the ever-more complex multidimensional world in which we live and work. It is an essential read for the novice and the professional with advancement in their future.”

—James Howe  
Founder and CEO, AgNovos Healthcare

“*Unstoppable You* offers research insights and valuable tools and methods for a new attitude and relationship to learning that is specifically designed for our times of constant change. What a gift to individuals who recognize this need, and to mentors and coaches who strive to support a lasting change.”

—Magdalena N. Mook  
CEO and Executive Director, International Coach Federation

“Patricia McLagan’s new book helps us all prepare for and navigate the future workplace. The concept of adopting a learning 4.0 mindset and making learning your daily habit is critically important to staying employable.”

—Jeanne C. Meister  
Co-Author, *The Future Workplace Experience*

“Drawing on her wisdom and experience, Patricia McLagan synthesizes the latest insights from neuroscience, psychology, adult development, and transformative learning to help readers upgrade and retool for the next century. Her seven-practice framework is supported by advice and tried-and-true tools that will open the door to sustainable learning for you and the teams you lead!”

Victoria J. Marsick  
Professor and Academic Director, Adult Learning & Leadership,  
Columbia University Teachers College

“Patricia McLagan’s 4.0 learning is a breakthrough concept for leadership success in the 21st century. The book is a gem, featuring solid concepts with very practical concepts and tools for becoming a 4.0 learner. This is a must-read for leaders.”

—Noel Tichy  
Professor, University of Michigan  
Author, *Succession*

“Successful leaders continually learn, making lasting connections between the wide range of facts, figures, and ideas they encounter. *Unstoppable You* is a logical, practical, and engaging guide to enhancing learning for yourself and those you develop for the future.”

—Steve Campbell  
Vice President, Organizational Development, UPS

“I can think of nothing more valuable than to teach people that learning is a lifelong process, because that’s how our brains are wired. *Unstoppable You* breaks down the research on how we best learn, both from our internal and external world, to apply the findings to our own lives in a user-friendly manner.”

—Dan Radecki  
Chief Scientific Officer, The Academy of Brain-Based Leadership

“*Unstoppable You* is a great resource that guides us in processing and deciphering information in a positive way. It will help those of us who are part of the younger generation propel our status in school, the workplace, and life.”

—Lauren Cozza  
Executive Assistant

“Many books overpromise and underdeliver, but this book is not one of those! *Unstoppable You* helped me understand how the brain works, how to stay motivated, and how to apply the seven learning 4.0 practices in nearly every area of my life. This book is a must-have for anyone who wants to maximize their time and increase their quality of life.”

—Martin Illetschko  
Business Partner, Xcel Energy

“This is a rare find: a practical and authoritative book about how to become a better thinker and learner. If you want the tools to continually reinform yourself for life, *Unstoppable You* is a must.”

—Bruce A. Jacobs  
Author, *Race Manners for the 21st Century*

“This important and timely book places the responsibility for adult learning where it should be, squarely on the individual. *Unstoppable You* provides the motivation and tools to become an efficient and effective learner in the 21st century. It should be given to participants in learning centers everywhere.”

—Jack Phillips  
Chairman, ROI Institute

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AND CHANGE YOUR LIFE**

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**PATRICIA A. McLAGAN**

**atd**  
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*My new granddaughter will be born the month this book is released. Her learning is already unstoppable—her brain is adding 250,000 neurons per minute. What an adventure she will have as she learns, develops, and thrives into the 22nd century. I dedicate this book to her; her cousins, Colin, Kathryn, and Ryan; and all children. They will experience and help create a world of learning that is inconceivable to us today.*





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*You have a powerful force in you. It is a force that emerged, at the rate of 250,000 new brain neurons per minute, in the months before you were born. It's a force that gathers momentum throughout your life; a major part of what it means to be alive.*

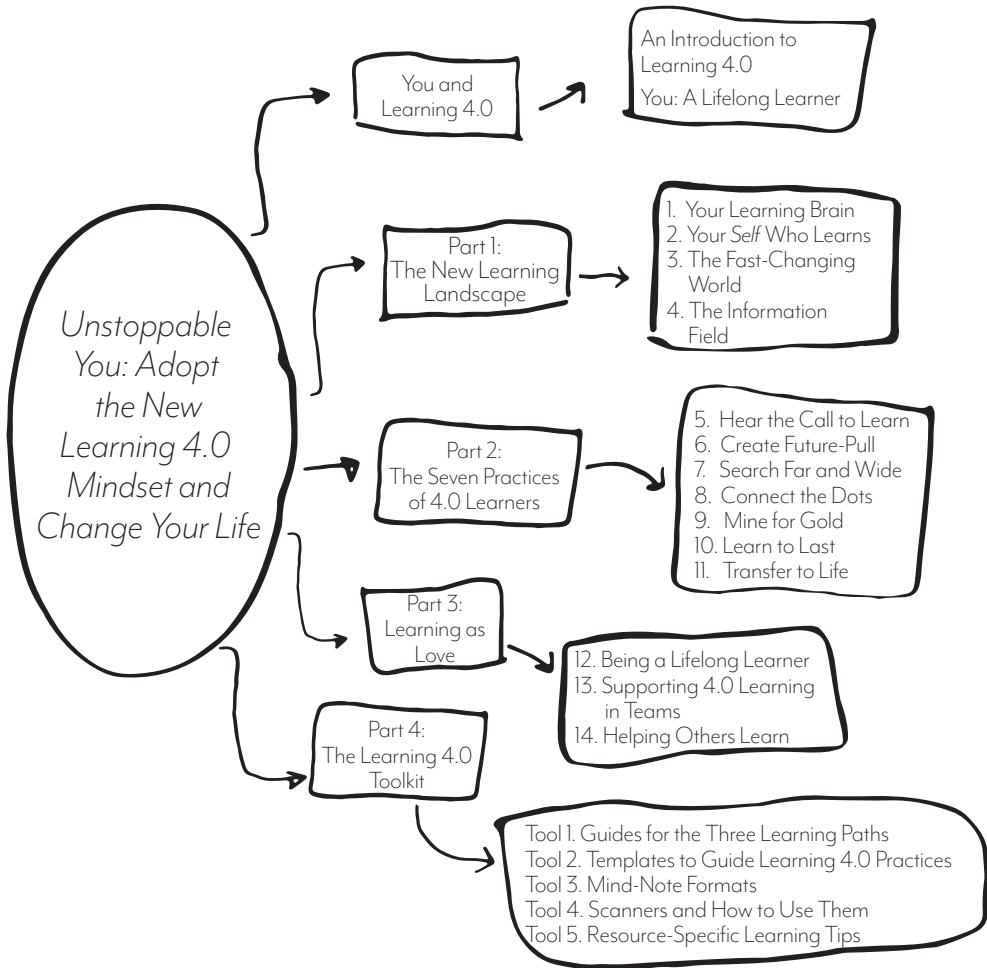
*This amazing, unstoppable force within you is your ability to learn.*

*Unstoppable You is about your unstoppable learning power. It's about how you can upgrade your own learning ability to learning 4.0 by implementing seven learning practices. With learning 4.0, your development and fulfillment will be unstoppable, and you'll unleash the full power of this amazing force for changing your life and supporting others in changing theirs.*

*Welcome to your future as the unstoppable you!*

*Visit [www.learning40.com/unstoppable](http://www.learning40.com/unstoppable) for a two-minute audio overview of the book and to take a short self-assessment.*







# An Introduction to Learning 4.0

You began an amazing learning journey the day you were born and it continues to this day. However, the world and you are changing; to keep up, you need to upgrade your learning skills so that you have the capabilities to survive and thrive in today's fast-changing world. *Unstoppable You: Adopt the New Learning 4.0 Mindset and Change Your Life* invites you to adopt a new learning upgrade—learning 4.0. Learning 4.0 is your ticket to a fulfilling and successful life—a life where you not only actively shape, but keep up with, these fast-changing times. It is a survival skill for the 21st century. This book is an invitation to upgrade yourself to learning 4.0. And it shows you how to do it.

## How Is Learning Changing? A Story of Upgrades

Think of how you learn as software that you use in your daily life. Like all software, it requires upgrades to help you adapt when conditions change. With these upgrades, you can do new things, solve more complex problems, take advantage of new discoveries and technologies, and learn better and faster.

Imagine three learning software upgrades that have occurred so far in human history: Learning 1.0 is the basic program that you were born with. It supported your trial and error learning by watching and imitating others. Your earliest learning ran primarily on that software.

You upgraded to learning 2.0 during your school years. Within structures that teachers and parents provided, you developed the foundational



knowledge and skills for being part of society and getting ready for work. You learned how to study and direct your learning toward goals that others set. Your 2.0 software helped you function in structured learning environments.

Then you left the structured primary and secondary school environment and entered a world where you were on your own. The capacity of learning 2.0 was not—is not—adequate for you as an adult. You need to be able to self-direct your learning, learn efficiently from both informal and unstructured situations, and make and implement learning choices on your own. As an adult, you are also in many situations where you can help others learn, whether in teams or from a parent, leader, or mentor position. The learning 3.0 upgrade supports you in these roles by including support for your self-managed learning and helping skills. It also helps you learn better from all information sources, both formal and informal. And with 3.0 you integrate information from diverse experiences, relationships, and resources so you can achieve your learning and change goals.

Many people—perhaps you—are not yet fully using or have not upgraded to learning 3.0. Are you taking advantage of its self-managed learning skills, increased capacity to learn and integrate ideas from a variety of sources, and mandate to help others? Without the upgrade to learning 3.0, most learning happens by trial and error. It's occasionally supplemented by something formal, such as a professional development class, an online learning module, or a training program at work. But if you haven't fully downloaded this important learning 3.0 software, this book will help you do it, because the 4.0 practices incorporate the best from all three previous software releases.

Learning 4.0 is the fourth major learning upgrade. It is still evolving; think of it as being in beta test form. But its implications for your learning and life are so important for thriving in today's nonstop world that it is worth launching it today and sharing it with every other adult in your network.

## Learning 4.0

Learning 4.0 builds on and sometimes transforms the capabilities in the three previous upgrades. But it is also radically different because it responds to some of the profound changes and new insights that are occurring in our world, including:

- **New knowledge about how our brains work.** We are learning more about our brains—and that knowledge opens doors to new techniques and better ways to work with our brains for great learning results. (Read more about this in chapter 1.)
- **Appreciation of the subjective.** We understand and are more willing to acknowledge the psychological and spiritual (nonrational) side of ourselves as humans—and how this affects the way we live and learn. (Read more about this in chapter 2.)
- **New dynamics of a nonstop world.** The way the world works is changing, because it is more connected and networked than ever before. This complexity affects everyone in some way, whether at home, at work, socially, or economically. (Read more about this in chapter 3.)
- **Exploding information field.** Information is increasing at accelerating rates, and it is being packaged and presented in a dizzying array of formats. This affects all areas of our lives and work. (Read more about this in chapter 4.)

## What's New in Learning 4.0?

Learning 4.0 is a necessary and exciting upgrade for surviving and thriving in this nonstop world. It is also the upgrade that will keep you in charge of, rather than becoming a servant to, increasingly intelligent technologies as they emerge. Let's look at a few of the special qualities of learning 4.0:

- **Imagination.** Learning 4.0 helps you anticipate the future and imagine yourself in it. With your learning 4.0 imaginative capability, you create and are guided into the future by your own self-generated virtual reality.
- **Whole brain and whole body.** Learning 4.0 helps you use the full capacity of your learning brain and body—your physiological, conscious, and unconscious functions.
- **Self-transformation.** Learning 4.0 draws on your deeper self-knowledge to help you more consciously transform yourself and your talents to live a meaningful and complete life.
- **Deep learning.** With learning 4.0, you see patterns in data, experiences, and even your own thoughts and actions. You use the increasingly powerful smart technologies, instead of being used by them.

- **Anywhere and anytime.** You develop the learning capacity to continually transform yourself for success in today's rapidly changing, digital world.
- **Smart use of information.** With learning 4.0, you find the best information for your needs, while recognizing and not being swayed by biases and data manipulation that are intended to influence your decisions and actions.
- **Resource versatility.** Learning 4.0 sees all learning resources as extensions of your brain, providing specific strategies for mining the gold in any resource or experience.
- **Change agency.** Learning 4.0 helps you successfully transfer your learning into your work and life environments. With learning 4.0 you make a difference in the world!
- **Co-evolution with technology.** Learning 4.0 helps you use smart technologies to achieve important and life-sustaining goals. You remain in charge of these technologies.
- **Shared experiences.** Learning 4.0 capabilities are sharable—you can bring these practices into groups and teams, and use them when you guide and support others' learning.

Learning 4.0 is just emerging, and it includes what you acquired in the first three updates (Figure P-1). But you can expect many more enhancements as we continue learning from brain research and psychology, and as we better understand the learning implications of the profound changes occurring in the world and the information field around us.

## Become a 4.0 Learner

I want to help you become a 4.0 learner. For now, this means imagining yourself as a 4.0 learner and then creating a strategy for reading and using this book. Start by engaging your imagination. Imagine yourself in five years, 10 years, even one year! What are you doing? What are you feeling? Who is around you? What impact are you having? How have you changed? What have you learned?

Figure P-1. Understanding Learning 1.0, 2.0, 3.0, and 4.0

	Learning 1.0	Learning 2.0	Learning 3.0	Learning 4.0
Type	Search	Social	Self-managed	Smart
Motivation	Consequences	Social approval	Meaning	Imagination
	Your basic genetic programming guides you to try things, imitate others, and learn from experience.	You learn the basic knowledge building blocks of society within the controlled school environment.	On your own, after formal schooling, you create ways to meet the challenges of adult life and roles.	You develop the learning capacity to continually transform yourself for success in today's rapidly changing, digital world.
Key Qualities	<ul style="list-style-type: none"> <li>• curiosity</li> <li>• trial and error</li> <li>• imitation</li> <li>• behavior shaped by rewards and punishments</li> </ul>	<ul style="list-style-type: none"> <li>• study skills</li> <li>• test-taking ability</li> <li>• learning within others' frameworks</li> </ul>	<ul style="list-style-type: none"> <li>• recognize situations requiring learning</li> <li>• prioritize goals</li> <li>• self-discipline to achieve longer-term goals</li> <li>• guide and teach others</li> </ul>	<ul style="list-style-type: none"> <li>• the 10 qualities of learning 4.0</li> </ul>

*Note: Each upgrade builds on or replaces capabilities from the previous versions.*

## Reflect ✦ Connect

Learning 4.0 uses your powers of imagination. Take this opportunity to bring imagination into your learning about learning.

Imagine yourself being a 4.0 learner. See yourself using and directing your amazing brain, learning while awake and while you sleep, and keeping up with and a bit ahead of the changes in your work and life in general. In this future vision, you are confidently learning in many diverse situations. You are aware of your own biases and you recognize misinformation and when others are trying to manipulate you. You are a smart learner, curious in the moment, and aware of learning opportunities even when they are subtle and easy to miss.

When you work with others, you bring curiosity and a learning orientation—you are open to new thinking and supportive of others' development. And you are courageous in bringing learning into your day-to-day life, even if it means influencing others and the environment around you.

Picture yourself grasping and remembering new knowledge, successfully developing new skills and habits, broadening your perspectives, moving to a higher plane of being “you.” Imagine what it's like to feel confident when you face a big learning challenge—a life change, a new assignment, a relationship change, a job challenge. See yourself on top of the information around you, not buried under it.

Steep yourself in this learning 4.0 vision, this self-generated virtual reality version of yourself in the future. Let it guide you as you read this book.

## Be a 4.0 Learner as You Use This Book

Like any book, *Unstoppable You* moves from the first page through to the end, but you don't have to read it that way. Tailor your approach to your needs and interests. First do a quick survey: Take a quick look at the sections and chapters, and check out the summaries, templates, and guides. Then, choose and use what you are interested in based on your needs. Read what you want, in the order you want. Use the information to help you develop a broad learning mastery, to advance in a specific learning 4.0 practice area, as a reference when you are learning, or for something else.



See tips for learning from a book in Tool 5. Resource-Specific Learning Tips.

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The mind map at the beginning of this book helps you visualize the book's sections and chapters. How do you think this book can support you as you move toward your learning 4.0 future vision? What do you want to get out of it? What looks most interesting? What will you read? What will you skip over (for now!)? What will you use later when you are in other learning situations? Will you take some notes along the way? How? Where will you start your reading?



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Consider taking some notes using one of the mind-note formats in Tool 3.

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Here are some options for your interactions with this book:

- If you are eager to learn the “how tos,” start in Part 2. The Seven Practices of 4.0 Learners.
  - Each of the seven practices has its own chapter. You can read any or all of them.
  - For a summary of the practices, see Tool 2. Templates to Guide Learning 4.0 Practices.
- If you are curious about the new learning landscape (your learning brain, your learning psychology, the fast-changing world, and the expanding information field), read any or all four chapters in Part 1. The New Learning Landscape.
- If you want to see how it all comes together for your lifelong learning, when you are working in teams, or when you are helping others, go to Part 3. Learning as Love.
- If you want to use this book as a toolkit and reference guide, but don't want to read anything in detail now, skim through all the pages to see what is here, and read the introduction. Make a mental note to use the templates, charts, and note-taking formats whenever they can help you learn.

Whatever approach you choose, I hope you will think about your time here as a conversation with me, the author. Ask questions, examine what's here, and link it to what you know. I'll offer my expertise and suggestions in response. We have a relationship, bound together by our interest in one of the most human of all abilities: the ability to learn, develop, and change!

Before you move into your strategy, I strongly recommend that you read the introduction, “You: A Lifelong Learner.” It will help you appreciate how far along you have come on this learning journey of yours—and encourage you to continue along your learning path. In addition, visit [www.learning40.com/unstoppable](http://www.learning40.com/unstoppable) to hear a two-minute book overview from the author and take a quick assessment of your learning quotient.



# You: A Lifelong Learner

Think of yourself on a lifelong learning journey where you periodically upgrade your learning skills and approach. Changes in you and changes in the world around you drive these upgrades. How has your learning evolved throughout your life? You are now entering a new era for learning and are on the precipice of new and exciting upgrade possibilities.

## Your Earliest Learning

You have been learning since before you were born. You learned to recognize your mother's voice. You began to develop preferences for music and city or country sounds. You learned about stress and calm from the chemistry in your mother's body. During that early development time, billions of neurons and potential capability pathways burst into being, readying you for the most complex programming that we know of in the universe.

The brain pathways that formed while you were in your mother's womb were not random. Some were organized into patterns of potential behavior drawn from eons of human evolution. You were getting ready for the growth of you, ready for a lifetime of constant wiring, rewiring, and developing your brain. In other words, you were getting ready to launch into a life of continuous learning!

Then came a massive burst of development as all your senses and that marvelous brain inside you encountered the external world, creating many more potential learning pathways than you would ever need as an adult. The connections that are not used by age three will gradually disappear. Brain



scientists call this “blooming and pruning.” So, your first years were very important for creating your brain infrastructure.

When you were little, most of your learning happened without your conscious awareness because you didn’t have the language to help you make meaning. You watched the people around you and began shaping your behavior to be like theirs. Without your conscious direction, the part of your brain that operates “incognito” (even today, this is most of your brain) began learning all it could about love and safety, food and feelings, cause and effect, and so forth.<sup>1</sup> Your brain continued to wire, rewire, and develop.

Then you began to acquire language and mobility—and wow, did your body and brain development accelerate. You soon developed the ability to expand your environment and to create information in your internal world. Your environment and the people around you played a major role in this early programing: You were significantly influenced by the rewards, punishments, and role models around you. More wiring, building, and developing.

This process of wiring, rewiring, and developing of material and connections in your brain continued through your childhood, adolescence, and early adulthood. And it goes on today!

## **Your Learning Through Adolescence**

Most of what you know about learning as a process is based on experiences in childhood and adolescence—in and for school. Your school experiences helped you upgrade from learning 1.0 to learning 2.0. You learned to learn to make good grades, pass tests, and please someone in authority. You probably equated “learning” with “studying” and filling your head with facts. Sometimes, maybe a lot of the time, you felt joy and discovery, but it was often in the context of the school experience. You may have seen learning as something somebody else organized and you didn’t often feel in control of the process.

Brain science tells us that during your school years and into early work life, hormone shifts make it difficult to consciously focus on learning. And this is all happening at a time when your conscious, executive brain functions are still under construction! Brain researchers tell us that the prefrontal cortex—the front part of our brain responsible for self-control and planning—isn’t fully developed until our mid-20s.

So, through your mid-20s, learning was your main job. However, the school context and your own chemistry determined many of your learning goals, what you did to learn, and your overall attitude toward the process.

## **Your Learning as an Adult: Upgrading to 3.0 and 4.0**

After these early years, you are left on your own as a learner. It is time for a new perspective and methods—for a broadened sense of yourself as a magnificent learning organism. However, research tells us that although 70 percent or so of an adult's learning is self-directed and managed, most adults don't manage it very well or skillfully. (Think about how many learning projects you have dropped.) The need for competent learning is there, but few people upgrade their learning capabilities beyond the 2.0 skills they learned in school. Even when friends, family, work colleagues, or managers try to help, they often draw on the learning 2.0 assumption that learning is primarily an information absorption and sharing process. For example, they may talk when they should listen. Or they dump lots of information on you when you need space and time to experiment and absorb. Perhaps they don't support you when you are stuck and instead try to solve your problems and make your decisions for you, not realizing that part of your learning comes from tackling these issues yourself.

You have been learning all your life, yes. But imagine bringing advanced learner powers to this amazing process that you have been engaged in since before you were born. It's time to upgrade your skills to learning 4.0. Let's get started!



# PART 1

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## **The New Learning Landscape**

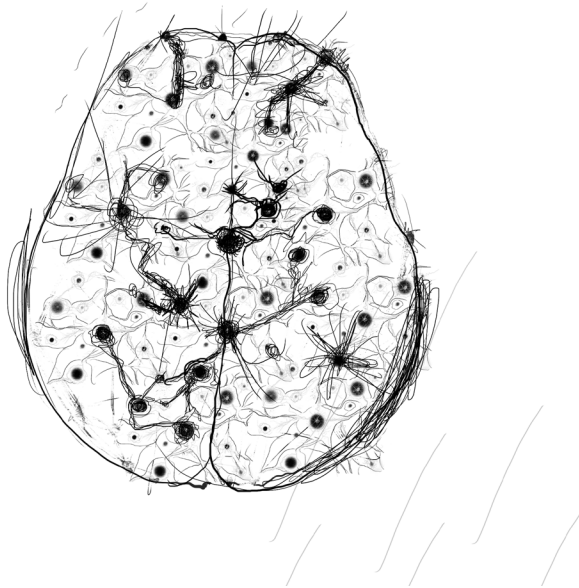
This section shares insights from brain scientists (chapter 1) and psychologists (chapter 2) that underpin learning 4.0. Knowing what they know will help you use learning to thrive and change. You will also be exposed to changes in the world (chapter 3) and information field (chapter 4) that are fundamentally transforming the role of learning in life and requiring learning 4.0 capabilities.



1

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# Your Learning Brain: What Neuroscientists Know



Technology now has the ability to look into our brains at work. The science is still in its infancy, but the early insights are very exciting. This chapter shares some of these insights with you so you can better use your brain's amazing powers in your life and learning. You will learn:

- about your brain as a collection of parts and as a powerful network
- what changes—in cells, chemicals, and brain waves—occur in your brain as you learn
- to see learning as a partnership between the conscious processes you direct and unconscious processes you can influence but not control
- how powerful and awesome your brain is—the most complex and mysterious phenomenon on the planet!





If you understand how your brain works, you will be a more astute user of learning 4.0 because you will know why some of the learning 4.0 practices work and be able to improvise your own methods. Thanks to your brain:

- Your eyes, ears, skin, nose, and taste buds take in and make sense out of information in your environment.
- When there are dangers or surprises, your adrenaline kicks in and you take quick action.
- You can find the information you need, even on a messy desk or through networks at work or socially.
- You can turn tasks that were hard to learn into habits that take less energy (think tying your shoes).
- You wake up in the morning with new ideas and solutions to yesterday's problems.
- You go beyond your own abilities by creating and using tools and technology to help find solutions to difficult tasks.
- You discipline yourself to follow a plan or a goal, even when tempted to do something else or just be lazy.
- Most amazing and magical of all, you are aware of yourself; you even talk to yourself while you do all of this.

You are made to learn. But how does it happen? How does your brain work? And how can you use it to learn better?

Brain science is a particularly hot topic today, thanks in part to new research and technologies (such as fMRI) that let you see what is happening inside your brain as you learn. We are just beginning to understand how the amazing brain-body-mind partnership works, and theories sometimes conflict. Learning 4.0 takes advantage of this emerging knowledge by shaping 4.0 learning practices. When you know how your brain works, you can improvise your own learning techniques. Improvisation and imagination are important qualities of a 4.0 learner.

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 Reflect ✦ Connect 

Stop and talk to yourself for a minute. What do you know about how your brain works? What questions would you like to answer as you read?

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Use your imagination as you read this chapter. Imagine yourself on an adventure inside your brain. Prepare to go behind what you see every day in the mirror.

Start as a 4.0 learner starts: by thinking about the questions you want answered as you go inside yourself as a learner. Get ready to be curious, feel wonder at the vast capabilities inside you, and become more confident because you know you have more capacity than you ever imagined.

## Your Senses: Letting the Outside World In

First take an imaginary spin around your senses—your eyes, ears, nose, skin, mouth, and taste buds. As you quickly circle these amazing receptors, appreciate the richness and variety of their capacity to monitor and bring the world that's out there to you.

Realize that your ability to learn is grounded in your senses and your physical body—you learn with your whole body. And 4.0 learning takes advantage of this because you deliberately make learning as multisensory as possible and create multisensory visions of yourself in the future. This creates multiple paths for later remembering.



While you are thinking about how your senses keep you connected with the world around you, there is a brain quirk to be aware of. Your brain is not a neutral observer. Centuries ago, Plato said that what we see is always ourselves projected on the world—much of what we see “out there” is coming from “in here.”<sup>1</sup> Neuroscience supports this view. As David Eagleman, science host of the television series *The Brain*, says, “We don’t perceive things as they are but as we are.”<sup>2</sup>

Because your filters are usually unconscious, you may miss or resist opportunities to acquire 4.0 learning practices that help you see beyond your own biases. This is important to understand because you don’t want to get trapped in your own assumptions while the world changes around you.

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✎ Reflect ✎ Connect ✎

Make a mental note to be aware of your filters and more open to a wider variety of information from the world around you. Ask, “Why did I pay attention to x (person, idea, situation) and not y?”

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## Your Brain Network’s Parts and Particles

This is a good time to remind yourself that your daily choices (eating, sleeping, exercise, positive and negative thoughts and emotions, choice of environment, attention, and so forth) affect everything that’s going on inside you. If your biological systems are not working well, they can create stress and detract attention and energy away from your ability to learn.

You are a very complex organism, and the majority of how you work is automatic, directed or supported in some way by your brain—the most complex organ on the planet. Most people take it for granted and know little about it. Even scientists who spend their lives studying the brain admit that they know very little. But take this opportunity to explore some of what we know about how your brain works so that you can use it better when you learn.

## Your Neurons: Underlying the Learning You

As your imagination travels inward past your senses and through your brain’s protective layers of bone, membranes, and brain-cushioning fluid, realize

that many very tiny cells are at the heart of your ability to learn. These are your nerve cells (neurons). You have about 90 billion of them. Neurons have tiny bodies that contain your DNA and do the processing that keeps them alive, and tails (some as much as a meter long) that carry messages to other neurons that may be anywhere in your brain or body.

Each neuron lives in a specific part of your brain or nervous system, receiving electrochemical signals from thousands of other neurons through thousands of little branches (dendrites) that reach across tiny spaces called synapses. When you learn, the structure of these little branches changes because of the electrochemical activity in the synapses.<sup>3</sup> Then the changes are communicated to other neurons along 90,000 miles or more of insulated nerve fiber channels.

On a physical level, neurons and their connections and communication routes are your ultimate learning target. But early-stage neuron changes are not very stable—something has to happen to support and strengthen them. Master learners know this and take actions like those you will learn in part 2 to help stabilize and sustain their learning.

It's a busy place inside your brain. Think about it—90 billion neurons, many with tails a meter long, making 100 trillion connections. This amazing, tightly packed, extremely complex network of neurons is the focus of a lot of brain science today, and is called the connectome.<sup>4</sup> And it's always changing—like right now, as you learn about your brain!

As you can imagine, your connectome uses a lot of energy. And, because a high concentration of neurons resides in the thinking, conscious—front—part of your brain, deliberate activities like learning take special effort. The practices and tools in this book recognize that your conscious learning brain consumes a lot of energy: They will help you manage the energy your learning requires.



So, if you are going to learn, your neurons and their connections must change in some way. The connections that are already in your brain are helpful here. Your brain can pull what you already know from your memory so you don't have to learn everything from scratch. Imagine what happens when people who are blind or deaf from birth are suddenly able to see or hear. The world will make no sense to them until they build up connections between the multiple, initially meaningless, sight and sound tapestries around them.

Your ready-made connections are a learning asset, but they can also be a learning liability. As you get older, it may take a bit longer to sort through your brain's existing connections to file something away or remember something. Some of those connections support very entrenched habit patterns that may not serve you well anymore. In addition, your brain naturally projects past experiences and assumptions onto your current reality. This means you may find yourself watching a movie created in your past instead of seeing what's in front of you. For example, if you meet an old high school friend, you may focus solely on what is familiar about her. When you project your past assumptions onto today, it's easy to say, "There is nothing new here." Unless you are aware of this brain distortion, you'll miss how your friend has changed since high school, when your initial view was formed.

Appreciate your brain and its billions of neurons and trillions of connections that are ready to support your learning right now! And feel confident that you have more than enough capacity inside you to shape and succeed in your learning and life.

It is utterly amazing, and it is all part of you!

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 Reflect ✦ Connect 

Reflect about what you just read. In brain language, take time to create strong and lasting connections among the neurons that you just activated. Ask yourself questions like, What are neurons and synapses? What is a neuron's role in learning? What is the connectome? How does information travel in your brain? Why do people sometimes have a different view of reality? What do you think about this brain of yours?

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## **The Bigger Parts and Regions of Your Brain**

Each of your neurons has many thousands of connections and is part of a network vastly more complex than the Internet or even the galaxies. But your neurons also live in specific areas of the brain. If you know more about these parts you will be better able to manage your learning habits so you can choose and use the right learning techniques.

## Your Cortex

The first thing you notice on this part of your journey is your cerebral cortex—the gray matter that covers the folded and convoluted mass (the cerebrum) that you see in most pictures of the brain. Mammals have a cortex; other creatures don't. Your cortex is very thin (a 10th of an inch) and has more layers of neurons than in other mammals. Those additional layers are called your neocortex. They are thought to support a lot of your more complicated conscious brain work, which makes them important for your deliberate learning. Your cortex contains 20 percent of all your neurons, and even though your brain is only 2 percent of your total body weight, it uses 20 percent of your energy. Researchers believe your neocortex consumes half of that brain energy.

How your brain works and how its parts work together are still big mysteries. It receives, processes, and integrates information from your senses and directs a lot of your behavior. But it does most of this work without your conscious attention. (There is no way you could consciously control 90 billion neurons and 100 trillion connections, any more than an executive in any organization can control the behavior of all the people in it!)

If everything you do were run by your automatic system, you wouldn't want or need a book about learning. But your brain has mechanisms to override your automatic and habitual behavior and help you adapt to and shape the world around you. Many of these mechanisms are unique to humans (and, to a lesser extent, to apes).

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### Reflect

There is a lot of scientific information in this chapter. How is your energy? Take a few deep breaths or get up and move around; take a five-minute break. It's OK to interrupt your learning and let your brain run on automatic for a few minutes.

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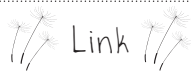
Most important to your special abilities as a human is the front part of your brain—your prefrontal cortex. It contains the densest connections (the connectome at work!) with other parts of your brain, which makes it

possible for you to manage yourself and to override your automatic behavior when hormones, excessive emotional reactions, or even habits want to take over! Electrical activity in that part of your brain sparks when you take more conscious control by planning, thinking critically, creatively solving problems, innovating, using self-control and will power, and acting for long-term benefit while sacrificing the short term.

Because it is a control center for conscious activity, your prefrontal cortex is the key to guiding learning 4.0 behavior. You use it to direct your attention and your learning process. You draw on its resources to set yourself up for success and control distractions that other parts of your brain may be drawn to. Your prefrontal cortex is a heavy energy user, though. So as a 4.0 learner you need to direct your learning knowing that you have an energy-management challenge. And you should find ways to both stimulate and minimize energy, put yourself into energy-efficient learning flows, use sleep, and strategically draw on natural brain chemicals (see chapters 9 and 10 for more).

## The Hippocampus: The Home of Your Short-Term Memory

To find additional parts of the brain that are important to your learning, you have to travel deeper into your brain. So, move your imagination to the place scientists think is your memory's first port of call: your hippocampus. This seahorse-shaped part of the brain works very closely with your neocortex when you are deliberately learning.<sup>5</sup> The hippocampus is like what's on your computer screen before you save it to your files. It is your working memory—the place where you first process new information before it gets stored someplace else in your brain.



In chapters 9 and 10, you will learn specific ways to assist your hippocampus in its important short- and long-term memory work!

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Your hippocampus also plays an important role in storing and finding memories later. It is like an Internet search service: indexing, storing,

combining, and retrieving information. Many scientists think that the hippocampus codes and indexes memory bits, helps them move to various storage places in your brain, and then finds and reconfigures the bits into meaningful memories when you call for them.

## Your Thalamus: A Busy Relay Station

This part of your brain receives electrochemical signals from your senses and sends them to the appropriate parts of your cortex, which then turn the signals into the sounds, images, and feelings you experience. During this process, the information from your senses mixes with information already in your brain. The result is that what is moving around in your brain or landing in your hippocampus is not exactly the reality outside you. Be alert to how your own stored memories are influencing your learning behaviors, even as you take the information in.

Your thalamus also regulates your sleep and wakefulness, so it plays a big role in attention, which is one of the most important success factors in learning.

## Your Amygdala: An Emotion Center

The next stop on this part of your inner-brain journey is this walnut-shaped emotional center. Your amygdala helps you recognize threatening situations, attaches emotional interpretations to events and thoughts, and helps you react fast to crises and danger. It usually gets visual, auditory, and other sense information from your thalamus. But in threat situations, it receives direct signals through a faster channel that bypasses the normal senses-to-cortex pathways.

Your amygdala is right next to your hippocampus (the place where your new memories initially land). This means that emotions will inevitably affect what you learn and how you learn and recall it. Your amygdala colors many of your memories with emotional overtones and plays a role in prioritizing your memories for storage; for example, you will be more likely to remember things that help you stay safe or that are associated with good or bad feelings. There is some evidence that your amygdala stores memories that are connected with fearful situations. This may explain why it is hard to unlearn these kinds of memories! Your amygdala is also the target of advertisers, politicians, and others who want to influence or even control your behavior. A 4.0 learner recognizes amygdala hijacking when it occurs.

 Link 

An implication for you as a 4.0 learner who wants to better remember something: Add emotional overtones to your learning. Learning 4.0 practices draw on this insight; for example, imagine how you want to feel after you've learned something.



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## Your Claustrum and Insula: Missing Links?

Before leaving this tour of your brain, stop to appreciate two of its more unusually mysterious parts: the claustrum and insula. They may hold the answer to the most burning question in neuroscience and psychology: How do physical parts like neurons, synapses, the cortex, and so forth translate into consciousness and self-awareness? That is, how can something physical (neurons, chemicals, brain parts) produce something intangible and subjective (your awareness). Currently nobody can answer this, and the laws of physics don't seem to apply!

One brain part that may be the link between the *what* (physical) of you and the *who* (mental, spiritual) of you is your claustrum, a thin sheet stuck under your cortex deep in your brain. It is unique because it seems to simultaneously give and receive input from everywhere in the brain. It also seems to bring various inputs together in some bigger orchestration, perhaps creating what you experience as consciousness. If this is true (and this is a controversial area in neuroscience), the claustrum may be a kind of internal missing link. Does it hold a key to understanding how biological parts create consciousness and our awareness of ourselves? Francis Crick, the co-discoverer of DNA, called the claustrum the “Neuronal Super Hub” and spent his last days trying to understand it.<sup>6</sup>

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 Reflect ✦ Connect 

Think about the power in your brain. Imagine your senses taking in information, your thalamus routing it through your neurons and connectome, your hippocampus and amygdala processing it, and your cortex storing it. And maybe your prefrontal cortex, claustrum, and insula helping to turn all the electrochemical signals into thoughts and feelings!

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Another interesting part of your brain that seems to play a big role in consciousness—especially feelings and social interactions—is your insula. This part of your cortex is folded deeply into your brain, and seems to affect your ability to empathize and to recognize, feel, and act on emotions. It is part of what makes your brain appreciate and participate in social learning. Like the claustrum, it may be the key to a larger integration, possibly of your entire emotional and social landscape.

Undoubtedly, someday we'll know more about how the claustrum and insula work and what they do. Can they turn the physical activities of your brain into thoughts and feelings? In that case, they are very important for your most difficult learning challenges. For now, it's mind-boggling just to know that your brain is designed to make all these complex associations and connections that are the physical basis of you.

## Your Chemicals and Waves

Chemicals and electrical waves also influence your learning success. When you know something about what they do and how they are triggered, you can design a learning approach that works for you, whether you are working toward a long-term goal or just trying to get something out of a 30-minute mobile course or game or conversation.

### Your Brain Chemicals

Your body contains and creates more than 100 chemicals! Let's look at a few you should be aware of in your 4.0 learner role.

**Adrenaline** helps you stay alert by releasing the brain energizing nutrient glucose. It also helps make your neurons' memory traces stronger. However, it can be addictive and depleting. (I'm sure you've heard of adrenaline junkies.)

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### Reflect ✦ Connect

Plan to design your learning to optimize adrenaline (urgency), endorphins (well-being), dopamine (feeling of accomplishment), and oxytocin (feeling part of a supportive community) as you advance toward your goal. And manage your stress levels to limit the damage that too much cortisol (anxiety) can cause. The tips in the rest of this book will help you optimize and minimize these chemicals.

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Your system unleashes **dopamine**—a motivating “feel good” chemical—when you achieve goals, satisfy a curiosity, or are surprised in any way. That rush of dopamine helps keep you motivated so you can continue working.

**Endorphins** are also important for feeling good. When high endorphin levels are present, you feel a general sense of well-being, which creates a receptive environment for learning. Aerobic exercise is a good way to increase your endorphins.

Another chemical that increases when you are with others or learning in teams is **oxytocin**. When you are bonding with other people and feeling empathy and connection, that’s oxytocin at work. It creates good feelings that you can use to help you keep learning, which is one reason to consider learning with others.

Then there is **cortisol**, the stress hormone. It keeps you on your toes in reaction to a threat, an anxiety, or a fear (including the perceived threat of a test). But it is generally damaging to your learning. While a small dose of it can help focus your attention and store memories, too much of it interferes with retrieving memories. Cortisol may help you prepare for a test, but will also make it difficult to take it! Cortisol stays in your system for hours, and too much of it over an extended period leads to chronic stress, which damages your neurons, the networks in your prefrontal cortex, and your amygdala. So, remember that this stress hormone affects your executive mental functions as well as your emotional health, both of which are important for your learning!

Is there a way to reduce the damage from stress? The answer is yes. There is a protein called brain-derived neurotrophic factor (BDNF) that works in the synapses of your neurons, where the changes that support your learning occur. BDNF strengthens your neurons’ electrical charge and even helps them grow more branches to encode your learning.<sup>7</sup> How do you stimulate your cells to produce this amazing asset for your learning? Through physical exercise! You can do anything from two- to three-minute sprints to longer exercise periods to stimulate BDNF production. Another big reason to keep moving!

## Your Electrical Waves



When your neurons fire, they create electrical waves that operate at different frequencies. Several wave patterns are usually operating at one time, but

the dominant waves change throughout your day. These waves affect your learning, but you can influence them by using specific techniques that you will learn in part 2. For now, just know that one of your jobs as a 4.0 learner is to try to match your brain waves to your current learning stage and challenge. Let's look at the main brainwaves, arranged from lowest to highest wave frequencies (number of wave cycles per second):

- Your slowest brain waves are infra-low. They are like the deepest water layer in the ocean—providing a stable base for higher brain functions. They are so slow (one wave every two seconds) that current equipment has a hard time tracking them.
- Ratchet up the energy levels and you arrive at another low-energy delta wave state (a half to three waves per second). You want to have long periods of delta when you are sleeping because that's when your body most restores itself.
- Theta waves (four to seven waves per second) use more energy. They operate in the space between awake and sleep, and seem to be important for information's transition into memory. Theta is also active when you are dreaming. (This is very important for learning because dreams are a time when there is no conscious control, but memories are consolidated.) When you are learning something and time seems to disappear, you are probably in a theta state (some say you are in flow).
- Alpha waves (eight to 12 waves per second) are active when you are relaxed but focused on what is happening right now, in the present moment. Because these waves seem to border conscious and unconscious states, they are often the target of meditation and mindfulness activities. These waves are also associated with higher creativity.
- Your beta waves are dominant as you solve problems and go about your daily work. They operate in a broad range of wave cycles (between 13 and 30 firings per second). They are slower when you are just exploring something, and faster when you are in complex thought and trying to integrate diverse information.<sup>8</sup> Caffeine seems to stimulate these waves.
- Gamma waves fire fastest (31 to 120 waves per second). These recently discovered waves appear when you are concentrating

especially hard or doing very complicated mental and emotional tasks. They also seem to be there when you have bursts of insight, which is something that makes us special as humans.

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 Reflect ✦ Connect 

Some of the practices in part 2 are designed to help you consciously influence your brain's chemicals and waves.

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While we don't fully understand the role of all these waves in learning, it's clear that different wave frequencies correspond to different kinds of brain processes. For example, when you are in a flow state of high-intensity learning, your waves are at the edge of alpha and theta. Additional mystery surrounds the slowest (infra-low) and fastest (gamma) waves. Like the claustrum and insula, these extreme-end waves may relate in an important way to higher consciousness and therefore to more learning potential. Better understanding them may help us better cope with the complex and fast-changing learning environments we are in today and continue to create. Updates to learning 4.0 will undoubtedly include ways to stimulate more of these waves. So, stay tuned to more discoveries here. In the meantime, the practices in this book will help you influence your brain-wave state.

Being a 4.0 learner starts with appreciating your brain's resources. Now that you know more about some of your brain parts, chemicals, and waves, and what they're for, it's time to learn a bit more about how your brain operates when you are learning.

## Two Processing Systems for Life and Learning

How do all these parts work together? For a start, it's useful to distinguish two major modes of brain work: automatic and conscious. On one hand, a lot of the work to keep you alive and adapting moment to moment is done automatically and unconsciously (your automatic system). On the other hand, you have immense capacity to direct what you do (your conscious system)—even if it means overriding what's automatic.

## Your Automatic System

Most of what you do is automatic. Neuroscientist David Eagleman puts it this way: “The brain runs its show incognito” most of the time.<sup>9</sup> What you do and how you react is usually habitual, routine, and programmed with the embedded knowledge from thousands of years of evolution and your own life experience. “Automatic” is your brain’s oldest, most developed, and—in many situations—preferred way to operate. Some scientists think it takes less energy to run on automatic, and that the brain’s goal is to keep it that way

Your automatic system acts fast and it takes over when you face unfamiliar or threatening situations. For example, you will automatically swerve your car when a deer jumps onto the road. You may have a flash of conscious thought, but your reaction is mostly automatic! (This is a good thing, because your automatic system processes this kind of information fast enough to save your life.)

When you are learning, your automatic system will first turn to familiar interpretations and habits, for it doesn’t like to spend much time in deliberate thought. Rather, it relies on previous knowledge, emotions and heuristics (rules you’ve developed from experience), and programming from eons of human evolution. These shape, or bias, your actions. When you learn you may want to examine and change some of this earlier programming.

Some of your automatic actions are a reward for many years of practice and learning: playing a sport, coordinating logistics, playing the guitar, running a well-designed meeting, flying an airplane, stocking a shelf for best marketing exposure, playing chess, or finding and fixing a computer problem are some examples. In cases like these, what you do may be very complex or have a hidden logic. Observers may think you are a born “genius.” But, because you worked hard to earn this deeper expertise, what you do is simply routine and automatic for you. While others look on in amazement, you achieve what looks difficult with little effort of your own.

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### Reflect ✦ Connect

What capabilities have you developed over the years that are automatic and seem easy today but took a lot of practice and hard work to develop?

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Your automatic system is a huge ally in consolidating learning. Once you've started to learn something, your automatic system can help you process and store the new information. If you've concentrated in the first place, then while you do other things, including sleep, your automatic system continues to process and file what you've learned.



Learn more about how biases affect learning in chapter 9.

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There is something else to know about your automatic system: It uses sleep to help you learn. Imagine yourself resting in a deep sleep while parts of your brain busily do a number of things in your mental underground: clearing paths; strengthening, connecting, and reconnecting neurons; sending what's in your short-term memory (hippocampus) to the neocortex for long-term filing. All this can happen in sleep because your conscious system is temporarily offline and not taking in new information.

While some of this automatic brain work happens as you go about your normal day, much of it happens while you're sleeping. To get these benefits, there must be something new in your short-term memory for your sleeping brain to process. And you need to sleep long and restfully enough to get these benefits—much of your memory storing and consolidation seems to happen your last few hours of a seven-hour sleep.<sup>10</sup> For this to happen, your automatic system needs the support of your conscious system to make sure you get enough sleep!



Learn more in chapters 9 and 10 about how to use sleep to support your learning.

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## Your Conscious System

Your conscious system oversees your thoughts and deliberate actions. With it, you set and pursue goals that you wouldn't achieve if you stayed on automatic. You use your conscious system when you solve complex and unique

problems and imagine alternate futures and ways to get there. You also use it to control and override automatic reactions, biases, and emotions that aren't appropriate for the situation or that will have negative future consequences. It is within your conscious system that you make the hard choices and judgments.

You use your conscious system for learning when you set agendas and scan for the best information and help; when you direct and focus your attention on what you want to learn; when you use deliberate learning techniques; when you replace old habits and routines with new ones; and when you make changes in your environment that support new behaviors. Use it to sustain your attention and energy for long-haul learning and difficult habit changes.

Your conscious system also helps prime, and even program, your automatic system to support and consolidate your learning while you sleep and do other things. Then, in the best learning situations, your conscious system can ensure that you draw on both!

Your conscious system uses the same physical resources as your automatic system—all your brain and body's resources. And while it relies on your automatic system, it also has the ability to override and even change what is automatic. This is something you do when you learn: You deliberately focus your senses and thought processes on your learning agenda. With extra training, you can even influence what your neurons, chemicals, and brain waves do.

## Your Learning Brain, in Brief

In this chapter, you've traveled inward to explore your learning brain. You discovered that neurons and their connections are where learning is encoded. You saw that although parts of your brain specialize in specific functions, it works as a connectome—a network filled with cross communication.

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### Reflect ✦ Connect

Stop for a few minutes and use your conscious system: Talk with yourself or somebody else about three or four insights you've gained about your learning brain. Compare your knowledge now with what you knew before you read this section. This will help you remember more of what you are learning.

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You briefly explored some parts of the brain that are important targets for 4.0 learning practices:

- senses (your connections with the world)
- cortex and neocortex (executive functions that drive and store learning)
- hippocampus (early memory formation, and later indexing and retrieval)
- thalamus (the information relay station)
- amygdala (an emotion processor that picks up emotional tones and colors and humanizes information)
- claustrum and insula (integrating and transforming physical impulses into consciousness).

And you saw the role that chemicals and waves play in supporting learning and moods around learning.

Finally, you learned that two information processing systems are at work inside you: Your automatic system runs most of the show, and you use your conscious system for deliberate work like overriding habits and knee-jerk reactions, mobilizing attention, and guiding behavior and learning in a purposeful way.

Being a 4.0 learner means taking charge of both your conscious and automatic systems, and supporting your entire body in the learning process. But from what perspective do you take charge? Something else is steering your conscious actions. It is your bigger you. To understand it, we leave the realm of biologists and brain scientists and enter the world of psychologists, philosophers, and mystics. They are the ones struggling to answer questions like, who is this bigger you? Who is the you who has unique aspirations and interests, the you who is on a totally unique life path, and the you who uses your amazing brain?

That's the focus of the next chapter.

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