



# Biological Learning and Control: How the Brain Builds Representations, Predicts Events, and Makes Decisions (Computational Neuroscience Series)

By Reza Shadmehr, Sandro Mussa-Ivaldi

Download now

Read Online 

## Biological Learning and Control: How the Brain Builds Representations, Predicts Events, and Makes Decisions (Computational Neuroscience Series)

By Reza Shadmehr, Sandro Mussa-Ivaldi

In *Biological Learning and Control*, Reza Shadmehr and Sandro Mussa-Ivaldi present a theoretical framework for understanding the regularity of the brain's perceptions, its reactions to sensory stimuli, and its control of movements. They offer an account of perception as the combination of prediction and observation: the brain builds internal models that describe what should happen and then combines this prediction with reports from the sensory system to form a belief. Considering the brain's control of movements, and variations despite biomechanical similarities among old and young, healthy and unhealthy, and humans and other animals, Shadmehr and Mussa-Ivaldi review evidence suggesting that motor commands reflect an economic decision made by our brain weighing reward and effort. This evidence also suggests that the brain prefers to receive a reward sooner than later, devaluing or discounting reward with the passage of time; then as the value of the expected reward changes in the brain with the passing of time (because of development, disease, or evolution), the shape of our movements will also change. The internal models formed by the brain provide the brain with an essential survival skill: the ability to predict based on past observations. The formal concepts presented by Shadmehr and Mussa-Ivaldi offer a way to describe how representations are formed, what structure they have, and how the theoretical concepts can be tested.

 [Download Biological Learning and Control: How the Brain Bui ...pdf](#)

 [Read Online Biological Learning and Control: How the Brain B ...pdf](#)



# **Biological Learning and Control: How the Brain Builds Representations, Predicts Events, and Makes Decisions (Computational Neuroscience Series)**

*By Reza Shadmehr, Sandro Mussa-Ivaldi*

## **Biological Learning and Control: How the Brain Builds Representations, Predicts Events, and Makes Decisions (Computational Neuroscience Series) By Reza Shadmehr, Sandro Mussa-Ivaldi**

In *Biological Learning and Control*, Reza Shadmehr and Sandro Mussa-Ivaldi present a theoretical framework for understanding the regularity of the brain's perceptions, its reactions to sensory stimuli, and its control of movements. They offer an account of perception as the combination of prediction and observation: the brain builds internal models that describe what should happen and then combines this prediction with reports from the sensory system to form a belief. Considering the brain's control of movements, and variations despite biomechanical similarities among old and young, healthy and unhealthy, and humans and other animals, Shadmehr and Mussa-Ivaldi review evidence suggesting that motor commands reflect an economic decision made by our brain weighing reward and effort. This evidence also suggests that the brain prefers to receive a reward sooner than later, devaluing or discounting reward with the passage of time; then as the value of the expected reward changes in the brain with the passing of time (because of development, disease, or evolution), the shape of our movements will also change. The internal models formed by the brain provide the brain with an essential survival skill: the ability to predict based on past observations. The formal concepts presented by Shadmehr and Mussa-Ivaldi offer a way to describe how representations are formed, what structure they have, and how the theoretical concepts can be tested.

## **Biological Learning and Control: How the Brain Builds Representations, Predicts Events, and Makes Decisions (Computational Neuroscience Series) By Reza Shadmehr, Sandro Mussa-Ivaldi**

### **Bibliography**

- Sales Rank: #1462325 in Books
- Published on: 2012-01-27
- Original language: English
- Number of items: 1
- Dimensions: 9.00" h x .69" w x 7.00" l, 1.71 pounds
- Binding: Hardcover
- 400 pages



[Download Biological Learning and Control: How the Brain Bui ...pdf](#)



[Read Online Biological Learning and Control: How the Brain B ...pdf](#)



**Download and Read Free Online Biological Learning and Control: How the Brain Builds Representations, Predicts Events, and Makes Decisions (Computational Neuroscience Series) By Reza Shadmehr, Sandro Mussa-Ivaldi**

---

## **Editorial Review**

### Review

An introductory examination of the book reveals many pages of somewhat daunting, complex mathematics; however, the text explains the mathematical applications thoroughly and, often, delightfully...Like the clever examples provided throughout this book, the insights into brain function provided by Shadmehr and Mussa-Ivaldi have broad applications. I believe this book would be a great choice for an undergraduate special topics course; it just might inspire greater interest in the biomedical applications of mathematics. **Peggy L Edds Walton BioScience**

This exciting book provides a coherent framework for understanding how the brain learns to control the body. By synthesizing recent advances with historical perspectives, it provides an accessible entry point for both biological and engineering students, as well as a valuable resource for professionals seeking to understand the workings of the brain.

(Daniel Wolpert, University of Cambridge)

As neuroscience moves into the 21st century, insights from theories, neurobiological and behavioral experiments are molded into an understanding of the nature of perception, action and cognition. The authors guide the reader through data and theory, revealing deep and beautiful insights into the way uncertainty and environmental constraints shape the way we move and learn.

(Konrad Kording, Associate Professor, Northwestern University; Lead Scientist, Rehabilitation Institute of Chicago, Center for Parkinson's Disease)

Almost 20 years have passed since Reza Shadmehr and Sandro Mussa-Ivaldi published their seminal work on motor adaptation, leading to an explosion of research on how we learn, retain, and generalize our movement skills. This book brings these studies together into a unified and coherent theory of adaptive motor control, synthesizing recent ideas on space perception, state estimation, reward maximization, optimal control, and many other fascinating topics. The result is sure to become an influential milestone in the field, leaving one eager to see what the next 20 years will bring.

(Paul Cisek, Department of Physiology, University of Montréal)

### About the Author

Reza Shadmehr is Professor of Biomedical Engineering and Neuroscience at Johns Hopkins University and the author of *The Computational Neurobiology of Reaching and Pointing* (MIT Press, 2005). Sandro Mussa-Ivaldi is Professor of Physiology in the Medical School at Northwestern University, with joint appointments in Physical Medicine and Rehabilitation and Biomedical Engineering. He is also Founder and Director of the Robotics Laboratory at the Rehabilitation Institute of Chicago.

## Users Review

### From reader reviews:

#### **Shane McKeel:**

Hey guys, do you really wants to finds a new book to study? May be the book with the headline Biological Learning and Control: How the Brain Builds Representations, Predicts Events, and Makes Decisions (Computational Neuroscience Series) suitable to you? Often the book was written by well known writer in this era. Typically the book untitled Biological Learning and Control: How the Brain Builds Representations, Predicts Events, and Makes Decisions (Computational Neuroscience Series)is one of several books this everyone read now. This kind of book was inspired many people in the world. When you read this e-book you will enter the new age that you ever know just before. The author explained their plan in the simple way, so all of people can easily to know the core of this e-book. This book will give you a lots of information about this world now. To help you see the represented of the world with this book.

#### **Glenna Monaghan:**

In this era which is the greater person or who has ability in doing something more are more important than other. Do you want to become one of it? It is just simple solution to have that. What you must do is just spending your time not much but quite enough to enjoy a look at some books. One of the books in the top collection in your reading list will be Biological Learning and Control: How the Brain Builds Representations, Predicts Events, and Makes Decisions (Computational Neuroscience Series). This book which can be qualified as The Hungry Hills can get you closer in becoming precious person. By looking right up and review this book you can get many advantages.

#### **Kathleen Owen:**

That guide can make you to feel relax. This book Biological Learning and Control: How the Brain Builds Representations, Predicts Events, and Makes Decisions (Computational Neuroscience Series) was bright colored and of course has pictures on the website. As we know that book Biological Learning and Control: How the Brain Builds Representations, Predicts Events, and Makes Decisions (Computational Neuroscience Series) has many kinds or variety. Start from kids until teens. For example Naruto or Investigation company Conan you can read and believe that you are the character on there. Therefore , not at all of book are usually make you bored, any it offers up you feel happy, fun and unwind. Try to choose the best book for you personally and try to like reading that.

#### **Helen Christopher:**

Many people said that they feel uninterested when they reading a book. They are directly felt this when they get a half parts of the book. You can choose the particular book Biological Learning and Control: How the Brain Builds Representations, Predicts Events, and Makes Decisions (Computational Neuroscience Series) to make your own reading is interesting. Your skill of reading ability is developing when you such as reading. Try to choose straightforward book to make you enjoy to see it and mingle the opinion about book and reading especially. It is to be very first opinion for you to like to wide open a book and examine it. Beside

that the book Biological Learning and Control: How the Brain Builds Representations, Predicts Events, and Makes Decisions (Computational Neuroscience Series) can to be your new friend when you're really feel alone and confuse in what must you're doing of the time.

**Download and Read Online Biological Learning and Control: How the Brain Builds Representations, Predicts Events, and Makes Decisions (Computational Neuroscience Series) By Reza Shadmehr, Sandro Mussa-Ivaldi #6M19K287WDJ**

# **Read Biological Learning and Control: How the Brain Builds Representations, Predicts Events, and Makes Decisions (Computational Neuroscience Series) By Reza Shadmehr, Sandro Mussa-Ivaldi for online ebook**

Biological Learning and Control: How the Brain Builds Representations, Predicts Events, and Makes Decisions (Computational Neuroscience Series) By Reza Shadmehr, Sandro Mussa-Ivaldi Free PDF d0wnl0ad, audio books, books to read, good books to read, cheap books, good books, online books, books online, book reviews epub, read books online, books to read online, online library, greatbooks to read, PDF best books to read, top books to read Biological Learning and Control: How the Brain Builds Representations, Predicts Events, and Makes Decisions (Computational Neuroscience Series) By Reza Shadmehr, Sandro Mussa-Ivaldi books to read online.

## **Online Biological Learning and Control: How the Brain Builds Representations, Predicts Events, and Makes Decisions (Computational Neuroscience Series) By Reza Shadmehr, Sandro Mussa-Ivaldi ebook PDF download**

**Biological Learning and Control: How the Brain Builds Representations, Predicts Events, and Makes Decisions (Computational Neuroscience Series) By Reza Shadmehr, Sandro Mussa-Ivaldi Doc**

**Biological Learning and Control: How the Brain Builds Representations, Predicts Events, and Makes Decisions (Computational Neuroscience Series) By Reza Shadmehr, Sandro Mussa-Ivaldi MobiPocket**

**Biological Learning and Control: How the Brain Builds Representations, Predicts Events, and Makes Decisions (Computational Neuroscience Series) By Reza Shadmehr, Sandro Mussa-Ivaldi EPub**

**6M19K287WDJ: Biological Learning and Control: How the Brain Builds Representations, Predicts Events, and Makes Decisions (Computational Neuroscience Series) By Reza Shadmehr, Sandro Mussa-Ivaldi**