Preface

Recent dramatic advances in our understanding of the human brain and cognition ensure that the cognitive neurosciences will play an increasingly important role in educational policy and practice during the 21st century. Imaging technology can now directly observe and report the brain activity of subjects engaged in a wide variety of experimental cognitive tasks, and this has led to a better understanding of the neuronal substrate of learning, thought, and behavior. That knowledge is leading to the development of successful treatments for learning disabilities—and it will also lead to improvements in teaching and learning in normal classroom settings.

The biological sciences will also affect educational policy and practice in other important ways. Developments in genetics and neuroscience are already raising complex moral, ethical, political, cultural, financial, and religious issues, and we can expect a contentious increase in such issues. Citizens in a democratic society will thus need a functional understanding of the biology of genetics and cognition if they are to make wise decisions on issues such as cloning and stem cell research and on proposed educational procedures that emerge out of cognitive neuroscience research.

A third-grade student today will be a voter in 10 years. Think of all the developments in biology that have occurred during the past 10 years, and project what might occur before our third-grader votes. Much more biology (and specifically cognitive neuroscience concepts and processes) will thus need to be inserted into the K–12 curriculum.

The typical K–12 educator currently lacks the biological background to do this effectively because teaching has historically been much more oriented to the social and behavioral sciences than to biology. This made sense in an era in which biology didn't focus on teaching-learning processes. Although the social sciences similarly

didn't focus on teaching and learning, their focus on group behavior was useful to teachers who work with students in a social setting. It thus isn't surprising that most preservice elementary teachers and many secondary teachers major in the social sciences.

Except for secondary school science teachers, few K–12 educators have the extensive academic preparation in chemistry, biology, and cognitive neuroscience that a 21st-century teacher will need. Furthermore, it will be difficult to insert more science coursework into an already packed teacher education program.

Conferences, staff development programs, and personal reading are currently helping to increase many teachers' cognitive neuroscience knowledge. It is perhaps only a bootstrapped beginning, but what are our options? This book assumes that in the foreseeable future, individual effort will be the principal venue for increasing the education profession's knowledge of the cognitive neurosciences. I sense that you agree with me because you probably wouldn't be reading this book if you didn't.

You will thus confront two challenges as you seek to increase your understanding of the cognitive neurosciences: First, to master the principal concepts and terms, and second, to teach the concepts and terms to your students and explain them to patrons.

Origin of the Book

The book had its beginnings in the early 1960s. Whenever I ran into an unfamiliar brain or biology term or concept in my reading and work, I created one or more pages for the term's definition plus background and supplementary information that I had culled from dictionaries, glossaries, and texts and I then alphabetized the pages into a growing stack. These pages of written definitions changed over time as I continued to read, and as I tried to explain the concepts in nontechnical terms to preservice and inservice educators. My initial audiences would typically look bewildered as I attempted to explain a technical concept, but after fine-tuning an explanation over subsequent presentations, I eventually would happily discover that folks were writing down my definition. I incorporated my successful explanations into presentation handouts, articles, books, and the monthly column I've written for the acclaimed Internet journal *Brain Connection* since the turn of the century (www.brainconnection. com). And so my

very personal, loose, informal, cognitive neuroscience encyclopedia grew. This book is kind of like stapling the left margins of my considerably updated 40-plus-year pile of encyclopedic pages.

It was a stimulating experience to go through my own files and published work as well as recent reports on exciting developments, decide which terms and concepts to include in this book, and then update what I had written earlier to reflect current knowledge. It's amazing how the cognitive neurosciences have matured during my career—and it's similarly amazing to realize how much we have yet to learn about our brain and its cognitive processes.

How to Use the Book

This encyclopedic handbook is designed to help you when you confront unfamiliar brain concepts and terms in your reading and work. Articles and books on our brain often lack a glossary, and many of the definitions they do provide are technical—not expressed in functional terms that educators can understand and use with students. Furthermore, readers often need to refresh their memory of a definition during subsequent encounters with the word, and it's often difficult to locate the original definition. This reader-friendly companion book will thus be a useful nontechnical resource to enhance your understanding of brain terms and cognitive processes.

The book contains close to 300 entries and cross references, covering the range of concepts and terms that you will confront when reading about educationally significant developments in the cognitive neurosciences. Entries will typically comprise two parts: (1) an initial short functional definition of the concept or term and (2) an expanded commentary that will provide useful background and supplementary information for subsequent use in student instruction and patron discussions. Reproducible schematic models and illustrations focused on key brain functions will further enhance your understanding and use of the concepts and terms.

As indicated earlier, the terms included in the book represent my selection of the educationally significant concepts you're most apt to confront in your work. I've linked brain terms in the text to the relevant schematic illustrations at the front of the book. I've also included Internet addresses of the best related Web sites and a selected list of recent useful books for general readers. These

resources should prove especially helpful to you if you want to track down an obscure term or the precise location of a brain structure that's difficult to depict in this book's schematic illustrations. For easy access to more than 1,500 detailed Internet illustrations of brain structures and systems, try using the BrainInfo database (http://braininfo.rprc.washington.edu/mainmenu.htmb) and the Whole Brain Atlas (www.med.harvard.edu/AANLIB/home.html).

Finally, my e-mail address is bobsyl@darkwing.uoregon.edu. If you don't understand something I've written or if you want information on a concept that isn't included in this book and can't easily locate it in a Web site, e-mail me and I'll respond quickly.

I've enjoyed my long journey toward understanding my brain and its cognitive processes—and I wish the same pleasure for you.

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