Brain Injury and Recovery
Theoretical and Controversial Issues
Brain injury and recovery.

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Preface

The idea for the present volume grew from discussions that the four of us had among ourselves and with our colleagues at recent scientific meetings. All of us were impressed by the wealth of empirical data that was being generated by investigators interested in brain damage and recovery from both behavioral and biological orientations. Nevertheless, we were concerned about the relative paucity of attempts to evaluate the data provided by new technologies in more than a narrow context or to present new theories or reexamine time-honored ideas in the light of new findings.

We recognized that science is guided by new technologies, by hard data, and by theories and ideas. Yet we were forced to conclude that, although investigators were often anxious to publicize new methods and empirical findings, the same could not be said about broad hypotheses, underlying concepts, or inferences and speculations that extended beyond the empirical data. Not only were many scientists not formally discussing the broad implications of their data, but, when stimulating ideas were presented, they were more likely to be heard in the halls or over a meal than in organized sessions at scientific meetings.

There are probably many explanations for this relative lack of theory. One might be that funding in the brain sciences currently emphasizes the development of new technologies and the measurement of discrete biological events. Another factor is that as graduate training has become progressively more specialized and technique-oriented, the holistic–historical perspective, which is conducive to generating broad theories, has been displaced. Related to this, the consensus today clearly seems to be that the safest path to a successful career is the generation of large numbers of empirical, “hypothesis-free” experiments that are uncontroversial and thus guarantee quick publication. Moreover, since many journals are largely data-oriented, publishing a theoretical paper can be difficult, especially if the concepts are controversial or if the idea is not yet supported by an extensive data base.

Because of these factors, and because the study of recovery from brain damage is still in a relatively early stage of development, the four of us decided that a volume encouraging established scientists to present or evaluate theoretical
issues in this field would be an interesting and informative endeavor. We wanted to have an opportunity not only to present new ideas but also to evaluate existing theories as well as the contributions of selected historical figures such as John Hughlings Jackson, Kurt Goldstein, and Margaret Kennard.

The result of this effort is the present volume, which examines both molar and molecular contemporary theories about the effects of brain injuries and processes of recovery. Selected chapters also look at the origins and current status of ideas presented by earlier theorists, and some even question how "recovery" should be defined, and why this field continues to be so controversial.

The production of this book was a very stimulating experience for all of us. It forced us to stand back and think—to go beyond the data at hand, to look at the "big picture," and to ask whether the experiments being conducted were even capable of answering some of the questions being asked. We think that the contributions to this book will likewise entice the reader to think about the issues presented here, the broad implications of his or her own specific scientific pursuits, and the direction of current research on the topic of recovery of function. We hope that this volume will stimulate and promote formal discussions of the issues that face us as we try to understand the dynamics of the nervous system and the various events that follow brain injuries.

Stanley Finger
St. Louis
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Toward a Definition of Recovery of Function

C. ROBERT ALMLI and STANLEY FINGER

1. THE PROBLEM DEFINED

The clinical and research literatures on the effects of brain damage can be very confusing because, all too often, the same word or term is used to define or describe different phenomena. Descriptions of various behavioral outcomes after brain damage lack consistent and precise terminology, and nowhere is this more apparent than with the use of the term "recovery of function." Four case studies illustrate the problem.

Case 1. A 40-year-old construction worker was hit on the head by a piece of falling metal. The man was rendered unconscious for a few hours, and after he awakened he appeared to be confused. Testing revealed that his memory was grossly impaired for a few days after the injury. Within a week, however, marked improvements were noted, and 1 month later there was no trace of memory impairment. Attentional and cognitive processes also appeared to be normal. The construction worker soon was able to return to his old job.

Case 2. A newborn baby was found to have a tumor on the left side of the brain in the region of Broca’s area. The tumor was removed, and the child’s progress was followed. The child was late in developing spoken language, but by the time this young girl was of school age, she was speaking fluently. Her teachers found her indistinguishable from her classmates in language functions.

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Case 3. Laboratory rats were given bilateral lesions of the lateral hypothalamus and monitored for food and water intake. Those animals not given special care suffered from dehydration and starvation and died within a week after surgery. In contrast, those who were force-fed and provided with highly palatable foods were able to maintain themselves by drinking water and eating standard laboratory chow. At this point, the latter animals were examined more carefully, and it was found that they still were below normal for body weight, that they were more finicky in dealing with foods made slightly bitter, and that they were unable to defend manipulations of body fluid and nutrient levels by altering drinking and feeding habits.

Case 4. A soldier was paralyzed on the right side of his body as a result of a gunshot wound to the head. The man, now confined to a wheelchair, was discharged from the army and given extensive rehabilitation training. Although once strongly right-handed, the soldier learned to use his left hand to eat, write, and brush his hair. When he returned to his home town, he obtained a job as a history teacher. Although he was forced to rely on his wife to drive him to and from work, this physically handicapped individual was doing well at his job and was accepted as an active and important member of the community.

These four case studies are presented because they share an important common feature. In each instance the brain-damaged subject showed notable improvement in overcoming at least some of the immediate effects of an injury to the central nervous system. Yet, on closer examination, each case is distinctly different. In the first case, there appeared to be a complete remission of symptoms over time, and in the second case, the symptoms that would have been expected in an adult never emerged in the child. In the third case, there were some residual effects of the brain injury that indicated that not everything was normal. And, in the fourth case, the salient feature was that the lost function remained lost even though the individual showed the stamina, motivation, and resourcefulness to adjust to his losses by using prosthetics and new strategies.

Are all of these cases showing "recovery of function"? Depending on the definition used and the inferences one is willing to make, one, two, or perhaps even all of the cases might be classified as "recovered," even though each case is obviously unique. The different ways in which the term "recovery" has been used have made it difficult to distinguish between it and other phenomena in the literature, phenomena such as "compensation" and "sparing," which we believe should be differentiated from recovery. In addition, the interchangeable use of descriptive words has at times resulted in such high levels of ambiguity and confusion that it has impeded progress in the field. It is in this context that we felt that a set of clear and precise definitions that could be used by both clinicians and experimentalists should be generated, presented, and defended.

In this chapter we show why recovery of function should be narrowly defined and why different definitions should be given to related phenomena. By defining a number of important terms, demonstrating the salient features of each,