



## Understanding Intelligence (MIT Press)

By Rolf Pfeifer, Christian Scheier

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By the mid-1980s researchers from artificial intelligence, computer science, brain and cognitive science, and psychology realized that the idea of computers as intelligent machines was inappropriate. The brain does not run "programs"; it does something entirely different. But what? Evolutionary theory says that the brain has evolved not to do mathematical proofs but to control our behavior, to ensure our survival. Researchers now agree that intelligence always manifests itself in behavior -- thus it is behavior that we must understand. An exciting new field has grown around the study of behavior-based intelligence, also known as embodied cognitive science, "new AI," and "behavior-based AI." This book provides a systematic introduction to this new way of thinking. After discussing concepts and approaches such as subsumption architecture, Braitenberg vehicles, evolutionary robotics, artificial life, self-organization, and learning, the authors derive a set of principles and a coherent framework for the study of naturally and artificially intelligent systems, or autonomous agents. This framework is based on a synthetic methodology whose goal is understanding by designing and building. The book includes all the background material required to understand the principles underlying intelligence, as well as enough detailed information on intelligent robotics and simulated agents so readers can begin experiments and projects on their own. The reader is guided through a series of case studies that illustrate the design principles of embodied cognitive science.

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### Editorial Review

#### Amazon.com Review

Most artificial intelligence seems artificially dumb. Sure, Deep Blue can beat a chess grand master two games out of three, but could it get out of the way of an oncoming bus? AI researchers are coming to understand that if we want more than idiot savants for machines, we'll need to build them from the ground up--a behavior-based approach. Rolf Pfeifer, head of the Artificial Intelligence Laboratory at the University of Zurich, and Christian Scheier, postdoctoral fellow at the University of Zurich and Caltech, have put together *Understanding Intelligence*, the definitive introduction to this approach for students, amateurs, and professionals alike. As they admit, there are plenty of gaps in our knowledge, so they take pains to make our ignorance as well as our knowledge explicit, and encourage thinking beyond the text with "Issues to Think About" at the end of each chapter.

Delving into neural networks, subsumption architecture, principles and design of intelligent systems, and future applications, the authors strive to exhaust the literature and compress it into concise, readable text with plenty of illustrations where appropriate. Given the freshness of the material, it feels less like a textbook and more like a treasure map--we don't know what we'll find when we get there, but we know it's going to be good. Whether robotics is a career, a hobby, or a side interest for you, *Understanding Intelligence* will help you get to work from the bottom up. --*Rob Lightner*

#### Review

"People trained in classical AI will find this book an articulate and thought-provoking challenge to much that they have taken for granted. People new to cognitive science will find it a stimulating introduction to one of the field's most productive controversies. Pfeifer and Scheier deserve our thanks for a thorough, assessable, and courteous contribution in the best tradition of scholarly debate."

—**H. Van Dyke**, *Computing Reviews*

"*Understanding Intelligence* is a comprehensive and highly readable introduction to embodied cognitive science. It will be particularly helpful for people interested in getting involved in the construction of intelligent agents."

—**Arthur B. Markman**, *Science*

#### About the Author

Rolf Pfeifer is Professor of Computer Science and Director of the Artificial Intelligence Laboratory in the Department of Informatics at the University of Zurich. He is the author of *Understanding Intelligence* (MIT Press, 1999).

Christian Scheier is a Postdoctoral Fellow at the California Institute of Technology, Pasadena, California.

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