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Preface to the Second Edition

Purpose

The purpose of *The Computer Science Handbook* is to provide a single comprehensive reference for computer scientists, software engineers, and IT professionals who wish to broaden or deepen their understanding in a particular subfield of computer science. Our goal is to provide the most current information in each of the following eleven subfields in a form that is accessible to students, faculty, and professionals in computer science:

algorithms, architecture, computational science, graphics, human-computer interaction, information management, intelligent systems, net-centric computing, operating systems, programming languages, and software engineering

Each of the eleven sections of the *Handbook* is dedicated to one of these subfields. In addition, the appendices provide useful information about professional organizations in computer science, standards, and languages. Different points of access to this rich collection of theory and practice are provided through the table of contents, two introductory chapters, a comprehensive subject index, and additional indexes.

A more complete overview of this *Handbook* can be found in [Chapter 1](#), which summarizes the contents of each of the eleven sections. This chapter also provides a history of the evolution of computer science during the last 50 years, as well as its current status, and future prospects.

New Features

Since the first edition of the *Handbook* was published in 1997, enormous changes have taken place in the discipline of computer science. The goals of the second edition of the *Handbook* are to incorporate these changes by:

1. Broadening its reach across all 11 subject areas of the discipline, as they are defined in *Computing Curricula 2001* (the new standard taxonomy)
2. Including a heavier proportion of applied computing subject matter
3. Bringing up to date all the topical discussions that appeared in the first edition

This new edition was developed by the editor-in-chief and three editorial advisors, whereas the first edition was developed by the editor and ten advisors. Each edition represents the work of over 150 contributing authors who are recognized as experts in their various subfields of computer science.

Readers who are familiar with the first edition will notice the addition of many new chapters, reflecting the rapid emergence of new areas of research and applications since the first edition was published. Especially exciting are the addition of new chapters in the areas of computational science, information

management, intelligent systems, net-centric computing, and software engineering. These chapters explore topics like cryptography, computational chemistry, computational astrophysics, human-centered software development, cognitive modeling, transaction processing, data compression, scripting languages, multi-media databases, event-driven programming, and software architecture.

Acknowledgments

A work of this magnitude cannot be completed without the efforts of many individuals. During the 2-year process that led to the first edition, I had the pleasure of knowing and working with ten very distinguished, talented, and dedicated editorial advisors:

Harold Abelson (MIT), Mikhail Atallah (Purdue), Keith Barker (Uconn), Kim Bruce (Williams), John Carroll (VPI), Steve Demurjian (Uconn), Donald House (Texas A&M), Raghu Ramakrishnan (Wisconsin), Eugene Spafford (Purdue), Joe Thompson (Mississippi State), and Peter Wegner (Brown).

For this edition, a new team of trusted and talented editorial advisors helped to reshape and revitalize the *Handbook* in valuable ways:

Robert Cupper (Allegheny), Fadi Deek (NJIT), Robert Noonan (William and Mary)

All of these persons provided valuable insights into the substantial design, authoring, reviewing, and production processes throughout the first eight years of this *Handbook's* life, and I appreciate their work very much.

Of course, it is the chapter authors who have shared in these pages their enormous expertise across the wide range of subjects in computer science. Their hard work in preparing and updating their chapters is evident in the very high quality of the final product. The names of all chapter authors and their current professional affiliations are listed in the contributor list.

I want also to thank Bowdoin College for providing institutional support for this work. Personal thanks go especially to Craig McEwen, Sue Theberge, Matthew Jacobson-Carroll, Alice Morrow, and Aaron Olmstead at Bowdoin, for their various kinds of support as this project has evolved over the last eight years. Bob Stern, Helena Redshaw, Joette Lynch, and Robert Sims at CRC Press also deserve thanks for their vision, perseverance and support throughout this period.

Finally, the greatest thanks is always reserved for my wife Meg – my best friend and my love – for her eternal influence on my life and work.

Allen B. Tucker
Brunswick, Maine

Editor-in-Chief



Allen B. Tucker is the Anne T. and Robert M. Bass Professor of Natural Sciences in the Department of Computer Science at Bowdoin College, where he has taught since 1988. Prior to that, he held similar positions at Colgate and Georgetown Universities. Overall, he has served eighteen years as a department chair and two years as an associate dean. At Colgate, he held the John D. and Catherine T. MacArthur Chair in Computer Science.

Professor Tucker earned a B.A. in mathematics from Wesleyan University in 1963 and an M.S. and Ph.D. in computer science from Northwestern University in 1970. He is the author or coauthor of several books and articles in the areas of programming languages, natural language processing, and computer science education. He has given many talks, panel discussions, and workshop presentations in these areas, and has served as a reviewer for various journals, NSF programs, and curriculum projects. He has also served as a consultant to colleges, universities, and other institutions in the areas of computer science curriculum, software design, programming languages, and natural language processing applications.

A Fellow of the ACM, Professor Tucker co-authored the 1986 Liberal Arts Model Curriculum in Computer Science and co-chaired the ACM/IEEE-CS Joint Curriculum Task Force that developed Computing Curricula 1991. For these and other related efforts, he received the ACM's 1991 Outstanding Contribution Award, shared the IEEE's 1991 Meritorious Service Award, and received the ACM SIGCSE's 2001 Award for Outstanding Contributions to Computer Science Education. In Spring 2001, he was a Fulbright Lecturer at the Ternopil Academy of National Economy (TANE) in Ukraine. Professor Tucker has been a member of the ACM, the NSF CISE Advisory Committee, the IEEE Computer Society, Computer Professionals for Social Responsibility, and the Liberal Arts Computer Science (LACS) Consortium.

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