

Reference Manual on Scientific Evidence

Second Edition

Federal Judicial Center 2000

This Federal Judicial Center publication was undertaken in furtherance of the Center's statutory mission to develop and conduct education programs for judicial branch employees. The views expressed are those of the authors and not necessarily those of the Federal Judicial Center.

An electronic version of the *Reference Manual* can be downloaded from the Federal Judicial Center's site on the World Wide Web. Go to

<http://air.fjc.gov/public/fjcweb.nsf/pages/16>

For the Center's overall homepage on the Web, go to

<http://www.fjc.gov>

Summary Table of Contents

A detailed Table of Contents appears at the front of each chapter

v	Preface, Fern M. Smith
1	Introduction, Stephen Breyer
9	The Supreme Court's Trilogy on the Admissibility of Expert Testimony, Margaret A. Berger
39	Management of Expert Evidence, William W Schwarzer & Joe S. Cecil
67	How Science Works, David Goodstein
83	Reference Guide on Statistics, David H. Kaye & David A. Freedman
179	Reference Guide on Multiple Regression, Daniel L. Rubinfeld
229	Reference Guide on Survey Research, Shari Seidman Diamond
277	Reference Guide on Estimation of Economic Losses in Damages Awards, Robert E. Hall & Victoria A. Lazear
333	Reference Guide on Epidemiology, Michael D. Green, D. Mical Freedman & Leon Gordis
401	Reference Guide on Toxicology, Bernard D. Goldstein & Mary Sue Henifin
439	Reference Guide on Medical Testimony, Mary Sue Henifin, Howard M. Kipen & Susan R. Poulter
485	Reference Guide on DNA Evidence, David H. Kaye & George F. Sensabaugh, Jr.
577	Reference Guide on Engineering Practice and Methods, Henry Petroski
625	Index

This page is blank in the printed volume

Preface

Thomas Henry Huxley observed that “science is simply common sense at its best; that is, rigidly accurate in observation and merciless to a fallacy in logic.”¹ This second edition of the *Reference Manual on Scientific Evidence* furthers the goal of assisting federal judges in recognizing the characteristics and reasoning of “science” as it is relevant in litigation. The *Reference Manual* is but one part of a series of education and research initiatives undertaken by the Center, in collaboration with other professional organizations, and with support by a grant from the Carnegie Corporation of New York, to aid judges in dealing with these issues. The *Reference Manual* itself responds to a recommendation of the Federal Courts Study Committee that the Federal Judicial Center prepare a manual to assist judges in managing cases involving complex scientific and technical evidence.²

The first edition of the *Reference Manual* was published in 1994, at a time of heightened need for judicial awareness of scientific methods and reasoning created by the Supreme Court’s decision in *Daubert v. Merrell Dow Pharmaceuticals, Inc.*³ *Daubert* assigned the trial judge a “gatekeeping responsibility” to make “a preliminary assessment of whether the reasoning or methodology underlying the testimony is scientifically valid and of whether that reasoning or methodology properly can be applied to the facts in issue.”⁴ The first edition of the *Reference Manual* has been republished by numerous private publishers and used in a variety of educational programs for federal and state judges, attorneys, and law students. The Center estimates that approximately 100,000 copies have been distributed since its initial publication.

This second edition comes after recent decisions that expand the duties and responsibility of trial courts in cases involving scientific and technical evidence. In *General Electric Co. v. Joiner*,⁵ the Supreme Court strengthened the role of the trial courts by deciding that abuse of discretion is the correct standard for an appellate court to apply in reviewing a district court’s evidentiary ruling. In a concurring opinion, Justice Breyer urged judges to avail themselves of techniques, such as the use of court-appointed experts, that would assist them in

1. T.H. Huxley, *The Crayfish: An Introduction to the Study of Zoology* 2 (1880), *quoted in* Stephen Jay Gould, *Full House: The Spread of Excellence from Plato to Darwin* 8 (1996).

2. Federal Courts Study Comm., *Report of the Federal Courts Study Committee* 97 (1990). *See also* Carnegie Comm’n on Science, Tech., & Gov’t, *Science and Technology in Judicial Decision Making: Creating Opportunities and Meeting Challenges* 11 (1993) (noting concern over the ability of courts to manage and adjudicate scientific and technical issues).

3. 509 U.S. 579 (1993).

4. *Id.* at 589 n.7, 592–93.

5. 522 U.S. 136, 141–43 (1997).

making determinations about the admissibility of complex scientific or technical evidence.⁶ Last year, in *Kumho Tire Co. v. Carmichael*, the Supreme Court determined that the trial judge's gatekeeping obligation under *Daubert* not only applies to scientific evidence but also extends to proffers of "'technical' and 'other specialized' knowledge," the other categories of expertise specified in Federal Rule of Evidence 702.⁷ Also, the Supreme Court recently forwarded to Congress proposed amendments to Federal Rules of Evidence 701, 702, and 703 that are intended to codify case law that is based on *Daubert* and its progeny.

This second edition includes new chapters that respond to issues that have emerged since the initial publication. The Introduction by Justice Breyer reviews the role of scientific evidence in litigation and the challenges that trial courts face in considering such evidence. Supreme Court cases subsequent to *Daubert* are summarized in a chapter by Margaret Berger. The philosophy and practice of science are described in a chapter by David Goodstein. New reference guides on medical testimony and engineering will aid judges with the broader scope of review for cases involving nonscientific expert testimony following *Kumho*. Reference guides from the first edition have been updated with new cases and additional material. The Reference Guide on DNA Evidence has been completely revised to take account of the rapidly evolving science in this area. To make room for the new material, essential information from the chapters on court-appointed experts and special masters was condensed and included in the chapter on management of expert evidence.⁸

We continue to caution judges regarding the proper use of the reference guides. They are not intended to instruct judges concerning what evidence should be admissible or to establish minimum standards for acceptable scientific testimony. Rather, the guides can assist judges in identifying the issues most commonly in dispute in these selected areas and in reaching an informed and reasoned assessment concerning the basis of expert evidence. They are designed to facilitate the process of identifying and narrowing issues concerning scientific evidence by outlining for judges the pivotal issues in the areas of science that are often subject to dispute. Citations in the reference guides identify cases in which specific issues were raised; they are examples of other instances in which judges were faced with similar problems. By identifying scientific areas commonly in dispute, the guides should improve the quality of the dialogue between the judges and the parties concerning the basis of expert evidence.

6. *Id.* at 147–50.

7. 119 S. Ct. 1167, 1171 (1999) (quoting Fed. R. Evid. 702).

8. Much of the information in those two chapters is available in Joe S. Cecil & Thomas E. Willging, *Accepting Daubert's Invitation: Defining a Role for Court-Appointed Experts in Assessing Scientific Validity*, 43 Emory L.J. 995 (1994), and Margaret G. Farrell, *Coping with Scientific Evidence: The Use of Special Masters*, 43 Emory L.J. 927 (1994).

Reference Manual on Scientific Evidence

This Reference Manual was begun and furthered by two of my predecessors, Judge William W Schwarzer and Judge Rya Zobel. Their work in developing the Center's program on scientific evidence established the foundation for the Center's current initiatives. In developing the *Reference Manual* we benefited greatly from the encouragement and support of David Z. Robinson, former executive director of the Carnegie Commission on Science, Technology, and Government, and Helene Kaplan, chair of the Commission's Task Force on Judicial and Regulatory Decision Making. A number of persons at the Center have been instrumental in developing this second edition of the *Reference Manual*. Joe Cecil and Dean Miletich served as editors of the *Reference Manual*. They profited from the advice and assistance of the following members of the Center's Communications Policy & Design Office: Geoffrey Erwin, Martha Kendall, Kris Markarian, and David Marshall. Rozzie Bell of the Center's Information Services Office offered great assistance in locating much of the source material. Finally, we are grateful to the authors of the chapters for their dedication to the task, and to the peer reviewers of the chapters for their thoughtful suggestions.

FERN M. SMITH

Director, Federal Judicial Center

This page is blank in the printed volume