PREFACE

For the rational study of the law the black letter man may be the man of the present, but the man of the future is the man of statistics and the master of economics.

—Oliver Wendell Holmes¹

The intellectual life of the whole of western society is increasingly being split into two polar groups. . . . Literary intellectuals at one pole— the other scientists. . . . Between the two a gulf of mutual incomprehension.

—C.P. Snow²

Judges and lawyers are not generally known for expertise in science and mathematics. Nor is science a subject given significant attention in American law schools. The reasons are manifold. Despite Justice Holmes’ prescient and often-quoted statement, the legal profession has perceived little need for lawyers to have a grounding in the scientific method. Indeed, law students, as a group, seem peculiarly averse to math and science. The American educational system is partly at fault, for students routinely divide, or are divided, into two separate cultures early in their training. Students who display a talent in math and science typically pursue careers in medicine, engineering, biology, chemistry, computer science, and similar subjects. Students with less inclination toward quantitative analysis very often go to law school. It is perhaps not surprising that the student who excels in the humanities soon learns that the best job opportunities for a graduate in Nineteenth Century Russian Literature can be found through law school. Whatever its origins, the legal profession today is a particularly salient example of a literary culture that remains largely ignorant of scientific culture.

Ever so slowly, however, there are signs that a “third culture” is emerging in the law. This third culture is one that integrates a sophisticated understanding of science into legal decisionmaking. Perhaps the most visible sign of this emerging integration is the United States Supreme Court’s decision in *Daubert v. Merrel Dow*

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¹ Oliver Wendell Holmes, Jr., The Path of the Law, 10 Harv. L. Rev. 457, 469 (1897).

² C.P. Snow, The Two Cultures and the Scientific Revolution 3 (Rede Lecture 1959).
The Daubert Court held that under the Federal Rules of Evidence trial court judges must act as “gatekeepers,” and evaluate the validity of the basis for proffered scientific expertise before permitting the expert to testify. In two subsequent cases – General Electric Co. v. Joiner and Kumho Tire Ltd. v. Carmichael – the Court further explicated the obligations that this gatekeeping role demands. These obligations were codified in the Federal Rules of Evidence in 2000. Moreover, states have increasingly followed the Supreme Court’s lead, with most adopting Daubert outright, and still others incorporating the insights of Daubert’s validity standard into their preexisting tests for admission of expert testimony.

Application of the Daubert standard requires an understanding of scientific research. Whether the Court fully intended to change the way the law responds to expert evidence, or had more modest expectations, is impossible to know. Without doubt, however, the many judges, lawyers and scholars who have written on the decision have discovered a revolution of sorts. This revolution is one of perspective, and it affects profoundly not only the judges who guard the gate, but also the lawyers who seek to enter through it.

Until Daubert, courts had applied a variety of tests, with most courts being deferential to the scientists in their respective fields of expertise. This role was most closely associated with the general acceptance test set forth in Frye v. United States. Frye instructed judges to admit scientific evidence only after it had achieved general acceptance in its field. The Daubert Court, in contrast, found that the Federal Rules of Evidence require judges themselves to determine the scientific validity of the basis for expert opinion. The shift in perspective is subtle yet profound. Whereas Frye required judges to survey the pertinent field to assess the validity of the proffered scientific evidence, Daubert calls upon judges to assess the merits of the scientific research supporting an expert’s opinion. Implicitly, as well, the Daubert standard contemplates that lawyers will have sufficient expertise to explain the science to judges when they make admissibility arguments. The Daubert perspective immediately raised the pros-

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6 293 F. 1013 (D.C. Cir. 1923).
pect, as Chief Justice Rehnquist decried it, of judges assuming the role of “amateur scientists.” The gatekeeping role, he feared, was one most judges were ill-suited to fill.

*Daubert* has not come to mean that judges must be trained as scientists to carry out admissibility decisions. No one expects judges to join physicists soon in the search for grand unified theories. But there is considerable space between being a trained scientist and being ignorant of science. Although *Daubert* does not require judges and lawyers to be scientists, it does demand a fair degree of scientific sophistication. *Modern Scientific Evidence* was formulated with that goal in mind. It is intended to introduce legal professionals to the rigors and details underlying scientific expert testimony. It offers an entry point to a host of scientific fields that are highly relevant to the law. It is not intended to provide simple “answers” or final “conclusions.” Instead, it is designed and organized to acquaint readers with scientific fields that are crucial to their practices.

*Daubert*, perhaps, represents nothing more, or less, than that the legal culture must assimilate the scientific culture. As compared to the sciences, the law obviously has different objectives, values, and timetables in which to work. The law should not, nor could it, adopt the scientific perspective wholly and without qualifications. Science is a tool that the law can and must use to achieve its own objectives. Science cannot dictate what is fair and just. We can confidently say, however, that science has become, and will forever more be, a tool upon which the law must sometimes rely to do justice.

**NOTE TO THE 2019–2020 EDITION**

*Daubert v. Merrell Dow Pharmaceuticals, Inc.*, the stimulus that gave rise to these volumes, was decided in June, 1993, now 26 years ago and counting. Although the impact of *Daubert* on trial (and appellate) practice continues to be heartily debated, we firmly believe that the decision was fundamentally revolutionary. It altered the admissibility inquiry from a superficial surveying of the “general acceptance” of the proffered expert evidence to the methodological soundness of that evidence. This changed perspective should have, and in many contexts has, required courts, and the lawyers that appear before them, to develop a deeper and more sophisticated understanding of empirical methods. Yet this particular revolution remains far from complete. Perhaps this is the nature of revolutions. As Zhou Enlai reputedly stated in response to being asked in 1973 about the French Revolution, it

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7 509 U.S. at 601 (Rehnquist, C.J., concurring in part and dissenting in part).
remains “too early to say.”

If the revolution promised by Daubert was that judges and lawyers would become more sophisticated consumers of science, no area better demonstrates its incompleteness than the non-DNA forensic identification specialties, such as fingerprints, firearms, bitemarks, hair, handwriting, and so forth. These experience-based specialties have been under attack by academic scientists and legal scholars—including in the first edition of this Treatise—for over 25 years. They suffered what was thought to be a terminal blow in 2009 with the publication of the National Research Council’s Report, “Strengthening Forensic Science in the United States: A Path Forward.” Yet, as discussed at length in Chapter 29, courts have largely ignored the virtually consensus opinion of mainstream academic scientists that much of the forensic expertise routinely admitted in courts today is unsound.

The latest statement of this consensus view came in September, 2016, in a lengthy and carefully reasoned report by The President’s Council of Advisors on Science and Technology (PCAST). The PCAST Report, “Forensic Science in Criminal Courts: Ensuring Scientific Validity of Feature-Comparison Methods,” was highly critical of several forensic areas, including complex DNA mixtures, bitemarks, latent fingerprints, firearms, footwear, and hair. Notably, PCAST only considered these six in detail, but many other areas of analysis, including handwriting and arson, would falter similarly under close scrutiny.

Unfortunately, the PCAST Report has been received with much the same indifference as the 2009 NRC Report. One illustration of that reception was the immediate response of Attorney General Loretta Lynch. She stated:

We remain confident that, when used properly, forensic science evidence helps juries identify the guilty and clear the innocent, and the department believes that the current legal standards regarding the admissibility of forensic evidence are based on sound science and sound legal reasoning. . .. While we appreciate their contribution to the field of scientific inquiry, the department will not be adopting the recommendations related to the admissibility of forensic science evidence.

Despite the intransigence of many legal actors—particularly in the realm of the criminal law—efforts like those of the NRC, PCAST, and the numerous legal and scientific scholars in this area will continue. In time, we expect, the aggregate of these efforts will begin to have a significant impact. These volumes were originally conceived, and continue, as a part of the attempt to bring greater scientific sensibilities to legal decision making.
As part of our continuing effort to keep Modern Scientific Evidence the most up-to-date resource available on its subjects, the 2019–2020 Edition provides significant updates across the five volumes. The law and science relationship is an ever changing one and we will continue to do our best to keep our readers informed of new developments and, when we can, propose ways to improve that connection.

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