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Researching The General Pattern of the Scientific Method
Problem Solving, Innovation, and Creativity

08-CV-005

September 24, 2008

Mr. Peter G. McCabe, Secretary
Committee on Rules of Practice and Procedure
Judicial Conference of the United States
Thurgood Marshall Federal Judiciary Building
Washington, DC 20544

Dear Mr. McCabe,

I would like to comment on the proposed change to Rule 26 of the Federal Rules of Civil Procedure.

In the paragraph on the exceptions, the words “and identify the assumptions relied on by the experts in forming opinions” should be changed to “and identify how they have applied the steps or stages of the scientific method in forming the opinions.”

My basis for this change is that in *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 579(1992), the U.S. Supreme Court ruled,

“But, in order to qualify as ‘scientific knowledge’ an inference or assertion must be derived *by the scientific method*. Proposed testimony must be supported by appropriate validation – i.e., ‘good grounds,’ based on what is known.” [emphasis added]

In *Rosen v. Ciba Geigy Corp.*, 78 F.3d 316, 318 (7th Cir. 1996), the Court said,

“Under the regime of *Daubert* . . . a district judge asked to admit scientific evidence must determine whether the evidence is genuinely scientific, as distinct from being unscientific speculation offered by a genuine scientist.”

For additional information, I enclose copies of my Research Reports #18A and 18B from my website www.scientificmethod.com.

Sincerely,



Norman W. Edmund

Accompanies letter from Norman W. Edmund, 407 NE 3rd Avenue, Fort Lauderdale, FL 33301

Research Report #18A

Use of the Scientific Method Required by the U.S. Supreme Court

The Scientific Method Must Be Used by Expert Witnesses

The Supreme Court of the United States requirement that the scientific method must be used to qualify an expert witness' testimony as reliable will have a far-reaching effect on the practice of law. In *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 509 U.S. 579 (1992), the U.S. Supreme Court took issue with what criteria should be used to determine the admissibility of scientific evidence. In the past, courts have relied on peer-reviewed evidence and evidence generally accepted by the scientific community. The court decided that *Frye v. United States*, 54 App. D.C. 46, 47, 293 F. 1013, 1014 (1923), no longer applied and instead that the Federal Rules of Evidence should be used. Judges were instructed to take a more "gate-keeping role" and to act more independently in assessing evidence, using relevance and reliability as their guide.

The Use of the Scientific Method Requirement Is Stated Exactly

In the *Daubert* decision, the U.S. Supreme Court ruled:

"But, in order to qualify as 'scientific knowledge' and inference or assertion must be derived *by the scientific method*. Proposed testimony must be supported by appropriate validation – i.e., 'good grounds,' based on what is known." [emphasis added]

In *Rosen v. Ciba Geigy Corp.*, 78 F.3d 316, 318 (7th Cir. 1996), the Court said:

"Under the regime of *Daubert* . . . a district judge asked to admit scientific evidence must determine whether the evidence is genuinely scientific, as distinct from being unscientific speculation offered by a genuine scientist."

Thus, in complex matters, opinions, theories, inferences, or assertions should be arrived at through use of the scientific method and not be just speculation or unsupported personal opinions.

Ensure "Expert" Witnesses Are Familiar with the Steps or Stages of the Scientific Method

Federal Rule of Civil Procedure 25(a)(2) establishes a procedure under which each party must, before the date of the trial, make a detailed written disclosure with respect to each expert witness retained to testify. It would greatly help judges and the defining of issues if these disclosures were required to follow a guide for the scientific method such as SM-14.

No standard formula has been adopted for the scientific method. Those in the literature are usually condensed versions which vary considerably. Be sure your experts are familiar with a full formula, such as SM-14.

Here I show the SM-14 formula for the steps or stages of the scientific method and some questions that might be asked of expert witnesses to ensure that the “expert” is not just offering “unscientific speculation.”

Steps of the Scientific Method and Questions for Expert Witnesses

Expert Witnesses Should Be Asked About Applying the Scientific Method

Step or Stage 1 – Curious Observation. Have you been curious about all aspects of the problem? Any new ideas?

Step or Stage 2 – Is There a Problem? What is your definition of the problem involved? Does this agree with the issues in this matter so that your testimony will add to the jury’s knowledge? Previous to this matter, how much research have you conducted in the direct area of the problem now in questions? Where?

Step or Stage 3 – Goals and Planning. Note: By verbally asking questions or by reading a written report of the witness’ goals and planning and how he or she researched his or her testimony, you will get an idea of his or her professionalism and whether he or she followed the scientific method.

Step or Stage 4 – Search, Explore, and Gather the Evidence. Did you, for this matter, improve your knowledge of the subject about which you will testify? Where, when, and to what extent?

Step or Stage 5 – Generate Creative and Logical Alternative Solutions. Did you generate and consider alternative tentative hypotheses? Did you consider all contrary evidence? Note: The quality of the answer may indicate professionalism or bias.

Step or Stage 6 – Evaluation. Did you do any testing or experimenting? Can you show in chart form an evaluation of all tentative hypotheses you considered?

Step or Stage 7 – Make the Educated Guess (Hypothesis). Were you able to arrive at a working hypothesis? Does it fit the problem as you defined it? Did you make predictions based on it? Is it in a form that can be tested?

Step or Stage 8 – Challenge the Hypothesis. What further tests, experiments, or research did you do to test it? Did the predictions work out? Did you attempt to falsify it as well as support it?

Step or Stage 9 – Reach a Conclusion. Explain your final hypothesis or theory and its value to the jury in reaching a decision.

Step or Stage 10 – Suspend Judgment. How certain are you that your final hypothesis is correct? What may yet make it wrong?

Step or Stage 11 – Take Action. Have you ever subjected the theory you are supporting or one very similar to peer review? If so, what support or opposition resulted?

Supporting Ingredients of the Scientific Method

The following supporting ingredients are part of the SM-14 formula to aid in understanding and teaching the scientific method. The addition of these to the SM-14 formula makes it reflect the whole system of science and thus the complete method of creative problem solving and decision making. The proper use of these by expert witnesses would contribute substantially to good grounds and good science that the U.S. Supreme Court requires in the use of the scientific method.

Ingredient 12 – Creative, Non-Logical, Logical, and Technical Methods. Which main action methods have you applied in this matter in using the scientific method? Are these methods regularly used in your domain? Is there an error rate involved?

Ingredient 13 – Procedural Principles and Theories. Have you applied the procedural principles, ethics, and theories normally used to produce unbiased research?

Ingredient 14 – Attributes and Thinking Skills. Have you used the personal attributes normally used in impartial research? Have you been skeptical in your research and reasoning?

Accompanies letter from Norman W. Edmund, 407 NE 3rd Avenue, Fort Lauderdale, FL 33301

Research Report #18B

The U.S. Supreme Court: Methodology and the Scientific Method

In December 1997, in *General Electric et al. v. Joiner*, 522 U.S. 136 (1997), the Supreme Court strengthened trial judges' power to bar controversial scientific evidence from their courtrooms. Appeals courts were ordered to exhibit restraint in second-guessing trial judges in cases in which they exclude controversial scientific evidence. This ruling is another example of the need for lawyers and judges to have a more complete understanding of scientific evidence and the methodology of the scientific method.

The U.S. Supreme Court makes a number of references to methodology in the *Daubert* decision. Several authors point out that the words "method" and "methodology" are ambiguous since they may have so many different meanings. It was misinterpretation of the word "method" that started false claims that the scientific method does not exist.

The Significance of the Scientific Method as a General Method for All Fields

I have previously quoted Copi, one of the many authors I encountered in my research who called attention to the scientific method being a general method. In the *Daubert* decision the U.S. Supreme Court quoted J. Zinman, who, in his book *Public Knowledge* (1968), acknowledges that the scientific method is a general method. It is simply that, since men of science first recognized the method and were the main developers and extenders of it, it became known as their method. They brought fame to it by the high degree of care and creativity they used. Research clearly shows that it is a general method. Now that the Supreme Court has recognized the scientific method, there is no reason that it should not be used in patent cases, business cases, and all other fields. I predict that this Court, for having recognized and for requiring the use of the scientific method, will go down in history for making one of the greatest landmark decisions of the twentieth century.

"Good Grounds," "Good Science," and "Reliable Foundation"

The U.S. Supreme Court used these three terms in its opinion. Basically, these requirements are met by *properly* following the steps or stages of the scientific method, using creative, non-logical, logical, and technical methods with the *proper* applicable procedural principles and theories with desirable personal attributes and thinking skills.

Decision Making Is Problem Solving – Another Reason for Learning the Scientific Method

Lawyers and their clients must always make decisions about what to do in complex matters. This is basically problem solving. For best results, the scientific method should be followed. See my websites www.decisionmaking.org and www.problemsolving.net.

Falsification

In the *Daubert* decision, the U.S. Supreme Court called attention to the theory of falsification in the testing of theories and techniques. Chief Justice Rehnquist, in his partial dissent, expressed concern whether federal judges would understand what was meant. The literature on falsification is confusing, but, in simple language, using the scientific method at Stage 9, Challenge the Hypothesis, you may offer supporting evidence, but you must also test and try to disprove or falsify your theory. Many “expert” witnesses fail to do this.

Scientific Knowledge and Scientific Evidence

In the *Daubert* decision and the Federal Rules of Evidence, there are many references to scientific knowledge, scientific evidence, and scientific validity. These terms are difficult to define.

If you attempt to search the literature for what scientific knowledge is, you soon find it to be an almost impossible task, for there are so many opinions, descriptions, disputes, and qualifications as to what science really is. In the *Daubert* decision, the U.S. Supreme Court may have had this diversity of expert opinions in mind when it said”

“That, nevertheless, is the balance that is struck by Rules of Evidence designed not for the exhaustive search for cosmic understanding but for the particularized resolution of legal disputes.”

“There Are No Certainties in Science”

In the *Daubert* decision, the U.S. Supreme Court states: “Of course, it would be unreasonable to conclude that the subject of scientific testimony must be ‘known’ to a certainty; arguably, there are no certainties in science.” In regard to suspending judgment, open mindedness, and certainty of knowledge, the best term I found in my research was that of Professor Childe:

“On the evidence available today the balance of probability favors the view that . . .”

This could be enlarged to the following, which would indicate more reliable knowledge:

“On the peer-reviewed evidence available today, the balance of probability and plausibility favors the conclusion . . .”

Scientific Method Review

Much Literature and Many Opinions about the Scientific Method Are Incorrect

The scientific method has not been adequately taught the last 50 years because of false claims it does not exist. This resulted in much reasoning in the literature and many opinions about the scientific method and related matters being incorrect. This applies even to the works of some of our greatest authorities and professional leaders. Be careful in your research in the field of law. There is a need for material simplifying science from a practical law outlook.

Teaching the Scientific Method

In the teaching of law, there is a strong movement to make teaching more relevant to actual practice. Part of this is to teach by the problem method (*Journal of Legal Education*, vol. 34, no. 4, pp. 654-673, Dec. 1984). This movement needs a base which can only be a good formula for the steps or stages to the scientific method, an example being SM-14. Thus, all interested in the teaching and practice of law should become familiar of the details of the scientific method.

The Scientific Method Is the Method of Knowledge

It has been stated that “knowledge is our biggest industry.” However, I stress that the scientific method has not been adequately taught in our schools. Use this website as a start to help you better understand what scientific knowledge, the scientific method, and good grounds are. Since this method is a natural one and the method of knowledge, you will probably find that you have been knowingly or unknowingly using it or part of it in your work. In *Teaching of Scientific Method* (1903), Professor H.E. Armstrong says, “The method of science, indeed, is the method of the Chancery Court . . .”

Another Endorsement of the Scientific Method

In the 1993 Supreme Court decision *Daubert v Merrill Dow Pharmaceuticals, Inc.*, the court reviewed the definitions of scientific evidence, scientific knowledge, scientific validity, and good science. As part of this case, the American Medical Association et al. filed an amicus brief in support of the respondent and stated:

“Scientific Knowledge” within the meaning of Rule 702 is knowledge derived from the application of the scientific method.