SANGER SWYSEN & DUNKLE

Science and the Law – A New Rule for Admissibility

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Introduction

After years of personally litigating the significance and admissibility of scientific evidence in both civil and criminal cases -- in such areas as bio-chemical patent infringement, micro-chip technology, class-action statistics and regression analysis, complex business economic loss, oil refinement processing and structural engineering, as well as, more traditional criminal case concerns like DNA, firearms, ballistics, pathology, odontology, pathology, neuropsychology, cognitive neuroscience, psychological testing, tire marks, gun shot residue, etc.[1] – I have concluded that the existing legal rules on admissibility are hopelessly vague and disorganized leading to a sea of cases that are even more disorganized. Neither the Federal Rules of Evidence nor the California Evidence Code gives judges the systematic tools to determine admissibility of scientific evidence or to determine what scientific opinions, if any, should be admitted.

I will set forth a more organized rule for use and discussion.[2] This rule allows judges to systematically evaluate each proffer of scientific (or expert) testimony in an organized fashion. It involves Four Stages whereby a judge asks four simple questions: 1) Is it a science? 2) Is the witness a scientist *as to this science*? 3) Is the data reliable? and 4) If so, based on this science and on reliable data, what can a real scientist properly report to a jury? For this to work, these questions have to be asked in sequential order.

The Determination of Admissibility

The basis of admissibility of scientific evidence can be located in the canonical texts (here *Daubert*,[3] *Joiner*,*[4]* *Kumho Tire[5]* and *Frye[6]* as well as their case law progeny[7] and in the Rules of Evidence,[8] the California Evidence Code,[9] law reviews, philosophy journals and journals of science and forensic overviews).[10] However, much else, both contradictory and confusing, can also be found in these sources.[11] The claim of this article is that a Four Stage analysis helps judges, as gate-keepers, make the call regarding scientific evidence and to do so by way of an *organized legal and scientific* analysis.

If challenged, the proponent of expert testimony has an obligation to establish the foundational facts to support the testimony.[12] With regard to scientific expert testimony,[13] the court logically then, is required to determine if the purported science that is the subject of the testimony is a valid science. It also requires the proponent to establish that the proffered witness is qualified with regard to that science. Then the proponent must show that the data upon which the expert relies is, in fact, reliable. If, and only if, the science is a real science, the witness is a real scientist and the data is reliable, then the court determines if the proffered opinions and conclusions of the witness are valid scientifically and relevant to the task of the jurors. Each of these four areas represents an independent procedural "Stage" which the judge should take up sequentially.

The Four Stages

1. Is it a Science?

This First Stage of the analysis of admissibility focuses on whether or not there is a body of knowledge to which the scientific method has been applied such that the *topic* of inquiry by the expert can be considered a science. Much has been written about this initial question but it is often mixed in with the other legal questions, such as whether or not the particular witness is qualified or whether the data analyzed is reliable. Sometimes the nature of the opinions and conclusions of the witness are debated before it is even determined that there is a science at all. This has led to confusion.

There are some objective criteria discussed in *Daubert* as well as in the scientific and philosophical journals as to what makes something a science. The judge does not have to be a scientist or philosopher to make this determination but the judge does have to make the inquiry. While scholars have long studied the process of principled judicial decision making, most judges would consider it to be the ideal that judges base their decision on neutral principles[14] and make them in a fair and consistent fashion.[15]

Therefore, determining what a science is should be based on scientifically valid criteria guided by sound legal procedures. Without this rigorous analysis, judges have allowed experts to testify regarding a lot of "junk science," including tool mark identification, shoe print analysis, criminal profiling, phrenology and others.[16]

The Stage One job of the trial judge in a case where an expert scientific opinion is proffered is to ask, "Is it a science?" It is not sufficient to ask simply if the witness has been qualified before or if he was a medical doctor or Ph.D. It would not suffice to ask if the testimony would help the prosecution or defense. The initial question should be whether the underlying science is an actual scientific discipline.

Certainly science and the scientific method have advanced substantially since the turn of the Twentieth Century when, as noted in a previous column, phrenology was considered by some a science. Nevertheless, a judge at the turn of the last century could have erroneously let in phrenology testimony by considering *curricula vitae* and data and opinions of proffered experts before asking the First Stage question, "Is it a science?"[17]

There are criteria which courts and scientists have recognized as relevant to the question of whether something is a science.[18] Suffice it to say that the original four "flexible" criteria of *Daubert* itself have direct application to this Stage One inquiry. Those are, a) is the purported science subject to falsifiability;[19] b) has purported science been peer reviewed; c) is the science subject to an acceptable range of error; and d) has the purported science been accepted in the scientific community?

2. Is the Proffered Witness a Scientist?

Stage Two determines whether or not the proffered witness is a scientist and whether she or he has expertise in this *particular area of science*. Much as been written about this and there has been a tremendous amount of litigation in this area, particularly in civil cases. Can a doctor who is not board certified in one area testify as an expert as to that subject? What if she or he has practical experience in the particular subject matter? Can an expert in one discipline testify as an expert in another? Interestingly, this is not something that is litigated very much or very successfully in criminal cases and that has led to wrongful convictions.[20]

Stage Two is only arrived at if the purported science is a science. So, the focus of this inquiry is whether or not this particular witness has the training, education and experience in the particular science to form the particular proffered scientific conclusions. The court should inquire as to whether the proffered witness is certified in these particular areas, although certification does not either qualify or disqualify the witness on its own. The court should inquire further: Has the witness been proficiency tested as to the particular tests in this case? Has the witness' work been peer reviewed? Is the witness or the laboratory she or he works for associated with one side or the other to the litigation?

3. Reliability of the Data

Once the court determines that it is a science and that the proffered witness is, in fact, a scientist in that science, then the court moves to Stage Three. In Stage Three, the proponent of the evidence is required to show that the data is collected and preserved for analysis and is tested in a reliable fashion.

For instance, DNA is largely regarded as the "gold standard" for forensic evidence.[21] The comparison of a known with an unknown sample is now established as a valid science. However, even with DNA, there can be problems with the collection techniques of the samples and the possible contamination of the samples before and after being collected. Mixed samples and degraded samples still give scientists problems in forming a scientific conclusion from the data. In addition, of course, lab protocols, adherence to testing procedures and contamination during testing raise issues.

The Stage Three judicial analysis requires that the proponent answer the following types of questions: Was the source of the evidence reliable? Were proper scientific collection techniques employed in retrieving the evidence? Were control samples taken? Was the chain of custody maintained? Were protocols employed to avoid contamination? Was the testing equipment clean, maintained properly and calibrated? Were controls used during testing? Was this proffered witness subject to reliable proficiency testing? Was the laboratory subject to review, accreditation and proficiency testing? Were any studies conducted pursuant to a "double blind" protocol?

4, The Opinions and Conclusions of the Witness in this Case

The final stage, Stage Four, occurs only if the court concludes that the proffered testimony is based on a real science, the scientist is qualified to testify about that science and is relying on reliable data. Then the question is whether or not this witness' proffered testimony is reliably based on the science and data and whether, as such, it will be of assistance to the trier of fact.

This Stage requires the court to answer a number of related questions which pertain to whether or not the actual testimony in this case is worthy of being submitted to the jury. Even if the proffered testimony is probative, it still must be weighed against the prejudicial effect, including time consumption and confusion to the jurors. This is a fundamental part of the gate-keeping function.

It is critical that these questions be taken separately from whether there is an underlying science and whether the witness is qualified as an expert in this science. One of the biggest criticisms of expert testimony in recent years, particularly in criminal cases, is that people who testify about a scientific issue and who have been qualified repeatedly as experts in the past are nevertheless asked to express non-scientific opinions in front of the jury. They are presented as authoritative witnesses, and the jury wants to rely on them. The problem is that they are not doing science and they are not presenting opinions and conclusions on the data that is consistent with science or the scientific method.

Stage Four requires the court to not only perform a gate-keeping function to keep out unreliable or unduly prejudicial expert opinions but it requires that the court also fashion specific limitations on the precise opinion an expert seeks to offer. Among some of the most misleading evidence that can be put before a jury is that of a highly educated and well-qualified expert who goes beyond the science and becomes an advocate for one side or the other.

In Stage Four, the court should ask: Can the witness describe the data in a scientific and non-biased fashion? Can the witness offer a sound scientific hypothesis, not just a conclusion that helps the proponent? Did the witness attempt to falsify or test the hypothesis?[22] What alternative hypotheses should the witness report to the jury? Is the opinion based on the actual science and reliable data and will that opinion help the jury to interpret the data? Has the witness been properly admonished not to be an advocate or to overreach her or his role in reporting the data and giving actual scientific conclusions?

Need for a New Rule

In order to make this Four Stage analysis work, judges have to implement it systematically. The Four Stage process is simple and not unlike other judicial tasks. However, we have to recognize that judges have been failing to understand the concepts involved in *Daubert* and its progeny and have barely performed better than lay jurors. Judges have to do better if they are going to fulfill their mandated role as "gate-keepers." To do this, judges do not need extensive training in science, although a refresher course would not hurt. They have the benefit of the party's experts and can appoint their own experts to advise the court.[23]

Therefore, we would propose a new rule of evidence that requires a finding as to each of the Four Stages and breaks down each Stage into a series of logical inquiries. Such a Rule would be represented by the chart, Fig. 1.

1. IS IT A SCIENCE?	A. IS IT *FALSIFIABLE*? (POPPER$_1$) B. IS IT SUBJECT TO *PEER REVIEW*? C. IS THERE AN ACCEPTABLE *ERROR RATE*? D. IS IT *ACCEPTED IN THE SCIENTIFIC COMMUNITY* (CURRENTLY)
2. IS THE WITNESS (W) A	A. WHAT *EDUCATION, TRAINING* AND *EXPERIENCE* DOES W HAVE AS TO *THIS SCIENCE*?

SCIENTIST *AS TO THIS SCIENCE*?	B. IS W *CERTIFIED* OR *QUALIFIED* IN THESE PARTICULAR TESTS OR SUBJECTS? C. HAS W BEEN *PROFICIENCY TESTED* AS TO THESE TESTS OR SUBJECTS? D. HAS W'S WORK BEEN *PEER REVIEWED*? E. IS W OR THE LABORATORY ASSOCIATED WITH ONE SIDE OR THE OTHER?
3. IS THE DATA RELIABLE?	A. WAS THE *SOURCE RELIABLE*? B. WERE *PROPER SCIENTIFIC COLLECTION TECHNIQUES* EMPLOYED? C. WERE *CONTROL SAMPLES* TAKEN? D. WAS THE *CHAIN OF CUSTODY* MAINTAINED? E. WHAT PROTOCOLS WERE EMPLOYED TO *AVOID CONTAMINATION*? F. WAS *EQUIPMENT CLEAN, MAINTAINED* AND PROPERLY *CALIBRATED*? G. WERE *CONTROLS* USED DURING TESTING? H. WAS THIS W AND THIS LABORATORY SUBJECT TO *PROFICIENCY TESTING*? I. WAS TESTING *DOUBLE BLIND*?
4. BASED ON THIS SCIENCE AND THIS RELIABLE DATA, WHAT CAN A SCIENTIST	A. CAN W *DESCRIBE THE DATA*? B. CAN W OFFER A *SOUND SCIENTIFIC HYPOTHESIS*? C. DID W *ATTEMPT TO TEST* THE HYPOTHESIS? (POPPER$_2$)

REPORT TO THE JURY?	D. WHAT *ALTERNATIVE HYPOTHESES* ARE PROPERLY REPORTED? E. IS THE OPINION HELPFUL TO THE JURY IN DETERMINING THE ISSUES IN THE CASE? F. HAS W BEEN *ADMONISHED NOT TO OVERREACH*?

We will leave it to another time to suggest the exact wording of the rule. However, it is hoped that this article and this chart can help prompt discussion about the necessity for a more legally and scientifically structured approach to judicial decision making on the admissibility of scientific expert testimony.

Conclusion

Many conclusions derive from this analysis. There is also case law to support each of the sub-questions under each of the Four Stages. Both of these subjects will be left for another day. However, I believe that, right now, we can properly advance this analysis in the courts, both state and federal, based on existing law. I also think that judges will actually find that the Four Stage process eases their burden when they use it to arrive at an opinion.

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[1] Other readers will have had even more diverse experience but, over the last three decades and some, I have been consistently engaged in cases, both civil and criminal, involving scientific evidence. This practical experience is coupled with (and may be occasioned by) an interest in science and philosophy which has helped lead to rethinking the rules for admissibility and testimony that are set forth herein. As may be apparent from other recent *Criminal Justice* columns, this is a process that has evolved over the last few years. I invite discussion from my colleagues in the community as to the wisdom, or lack thereof, of the approaches suggested in this article.

[2]The last two *Criminal Justice* columns have pertained to background for this proposed rule and the Four Stage rule itself was first suggested in the column in the February issue of the *Santa Barbara Lawyer Magazine*. The research and conclusions on this subject are being reduced to a law review article which will include comprehensive citations.. For the purposes of this column, I will forego most footnotes.

[3] *Daubert v. Merrell Dow Pharmaceuticals*, 509 U.S. 579 (1993).

[4] *General Electric Co. v. Joiner,* 522 U.S. 136 (1997).

[5] *Kumho Tire Company, Ltd. v. Carmichael*, 526 U.S. 137 (1999)

[6] *Frye* v. *United States,* 54 App. D. C. 46, 293 F. 1013 (1923).

[7] For a collection of cases, see: Cwik and Hutcheson, *Scientific Evidence Review*, Monograph No.8, American Bar Association, Section of Law and Technology (2008); Imwinklereid, *The Methods of Attacking Scientific Evidence*, Michie; and 60 Am. Jur. Trials 1 (Updated April 2011).

[8] FRE 702 regarding testimony by experts, 703, the basis for opinion testimony by experts as well as 403 regarding exclusion of evidence that is more prejudicial than probative. as well as 103 and 104, setting forth the procedure for an *in limne* hearing on the foundational facts to support proffered testimony.

[9] California Evidence code Sections 800 through 805 , Section 402 and Section 352.

[10] This bibliography will be available in the expanded version of this paper. See footnote 2, *supra*.

[11] The grant of review in the *Lockheed Litigation Cases*, 23 Cal. Rptr. 3d 762 (Ct. App. 2005), *petition for review granted*, 110 P.3d 289 (Cal. 2005), *petition for review dismissed*, 83 Cal. Rptr. 3d 478 (2007). seemed to suggest a need to clarify the law in California before their untimely demise

[12] See FRE 103 and 104 ; see, e.g., California Rule of Evidence 402 and 403.

[13] We will proceed with the analysis primarily regarding scientific expert testimony but, as *Kumho Tire* indicates, this analysis is applied in modified form to all expert testimony.

[14] See, Herbert Wechler, "Toward Neutral Principles in Constitutional Law" 73 Harvard L.R. (1959)

[15] See, e.g., John Rawls, At theory of Justice, Harvard University Press (1972) or Ronald Dworkin, Justice for Hedgehogs, Belknap Press Harvard (2010).

[16] While there are many articles and some books on this subject, the national Academy of Sciences issued a seminal report in 2009 addressing specific areas of concern in forensic testimony. National Academy of Sciences, *Strengthening Scientific Evidence*, National Research Council , The National Academies Press (2009) The Reverence Manual on Scientific Evidence, 3rd Ed, Federal Judicial Center (2011) is also a great source of comments and criticisms of various forensic enterprises. Both works are relatively neutral and both gathered information from multiple scientific and forensic sources.

[17] In recent years, in a case was involved in, a lawyer actually offered the expertise of an "ufologist" to corroborate his witness who was being impeached for claiming to have extraterrestrial visitors in his closet at night. The ufologist, a self-proclaimed expert on UFO's, who claimed a doctoral degree, turned out to be a podiatrist with a radio program.

[18] See footnote 1, *supra*.

[19] This is the Popper$_1$ issue discussed in last month's column.

[20] The Federal Judicial Center has made a point that Judges let in most testimony proffered in criminal cases without adequate examination. See *Manual* 3d ed. 62 citing Samuel Gross, *Exonerations in the United States,* 95 J. Crim. L and Criminology, 523 (2005).

[21] National Academy of Sciences report, *supra*.

[22] This is the $Popper_2$ analysis referred to in last month's column.

[23] FRE 706; California Evidence Code Section 730.