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The Search for Certainty and the Uses of Probability

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ABSTRACT: Some recent papers by document examiners have included discussions of findings stated in terms of probability and have raised questions about the propriety of giving such testimony in criminal trials. The present paper asserts the view that formation of a conclusion is progressive; that examination may be terminated in some cases with a statement of probability; and that the examiner must report whatever conclusion he or she has and must describe the evidence that brought about that conclusion. If, as the result of laboratory work, the document examiner is asked by competent authority to appear in court, he or she has an obligation to take the witness stand and respond to questions of attorneys and the court.

KEY WORDS: questioned documents, testimony, probability, certainty, warranted assertion, document examiner

Everyone has heard that mindless expression, "Experts always disagree." Of course, they do not always, but they do sometimes. However, their differences are unlike those among nonspecialists who may disagree for no discernible reason, for irrelevant reasons, or from pure contrariness with little disposition toward reconcilement. On the contrary, experienced persons who have made a study of how to reach reliable judgments and conclusions, how to avoid error while giving the largest number of useful judgments, and how to use language precisely to convey the results of analysis almost always find themselves in agreement, within a reasonable tolerance, with specialists in the same field. On those rare occasions when they have reasons for disagreement, they should strive to explain those reasons and to reconcile differences as a way of coming closer to truth and for making a particular discipline more useful to the purposes of the law.

Reasons for differing with the positions set forth in recent papers [*1-3*] have been given in the papers by Cole [*4-6*] that preceded them and are extended in this paper. Those papers concern differences in views about reports and testimony by forensic document examiners when given in terms other than a simple positive or negative, that is, as a conclusion expressed in terms of probability.

McNally [*1*] speaks of the document examiner as working side by side with the investigator; the examiner assists "an investigator in evaluating and building a case, ... instructs, gives preliminary findings, ... suggests various methods of acquiring specimen writings, eliminates various writings, [and] directs what type of writing to acquire." It is then said that when the examiner arrives at an opinion as to authorship he must be prepared to testify in court. From this and other parts of the paper it may be assumed that the specific question put to the examiner toward the end of the investigation is, "Can

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you testify to a positive identification?" This type of question carries the tacit demand, "Answer yes or no."

A different question is contemplated in the Cole papers [*4–6*], a question that is much broader and does not impose a limit on what the examiner may report. The examiner is thought of not as working side by side with the investigator but as working in a laboratory where there is some formality about acceptance and return of documents and where the examiner understands his duties to be those of reporting upon any item of evidence and of summarizing that evidence by statement of an opinion or conclusion that may express certainty or any degree of probability. In the Cole papers, the question, or rather the request for service, is understood to be, "Please examine these documents, make all necessary analyses and comparisons, and report your findings." A specific question may be added. In response to that request the examiner cannot withhold the description of and the comment on any item of evidence, even one of limited significance. It is clear then that the form of the question or request for service and the conditions of the examination will affect the content of the report.

While the examiner accepts the rule that positive identification must be one in which the documents produce nothing that could serve as the basis for material doubt, he should not think of this rule as embodying the view that the defendant is innocent until proved guilty, which rule McNally [*1*] suggests should bar the document examiner from giving testimony about probability. The examiner should not think of a writer as defendant, nor by any other label that might carry bias, and he should not think of the identification of two specimens of writing as being equivalent to establishing guilt. Guilt is the determination to be made by judge or jury. The rule of innocent until proven guilty beyond a reasonable doubt is imposed on judge and jury, not on investigators, lawyers, laboratory workers, and forensic scientists who have a professional code that is no less rigorous; indeed, it is more rigorous for having been devised by a professional body as a direct guide for professional conduct and requires high responsibility to all, inside and outside the court.

The jury is not required to find that each class of evidence by itself proves guilt beyond a reasonable doubt, but that the total evidence in a criminal case has this effect. Therefore, a jury may safely consider evidence about probability and may consider other related evidence that could raise probability to a certainty.

It is interesting and profitable to read dictionary definitions of key words, and equally so to study the analyses of words by outstanding persons who have used these words with great meaning; thus, Keynes [*7*], on "certain" and "probable," states:

> The terms "certain" and "probable" describe the various degrees of rational belief about a proposition which different amounts of knowledge authorize us to entertain. All propositions are true or false, but the knowledge we have of them depends on our circumstances; and while it is often convenient to speak of propositions as certain or probable this expresses strictly a relationship in which they stand to a corpus of knowledge. . . .
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> Every probability lies on a path between impossibility and certainty; it is always true to say of a degree of probability, which is not identical either with impossibility or with certainty, that it lies between them.
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> Thus certainty, impossibility and any other degree of probability form an ordered series. This is the same thing as to say that every argument amounts to proof, or disproof, or occupies an intermediate position.

There are a number of procedures in chemistry and physics that cannot be carried out successfully unless there is good control of surroundings—temperature, humidity, light, clean air, freedom from vibration, and so on. Can it be said that a man or woman endeavoring to form a judgment in a difficult matter is not affected by surroundings? Some surroundings that the document examiner should insist on are the right to consider the document from all possible standpoints, the right to formulate questions of his or her own

in addition to the question submitted with the document, the right to report all relevant observations, and the right to state the degree of certainty or probability believed to be warranted by the evidence. Many others can be added, such as good light and control of light, full use of optical and photographic aids, and especially time for the examination free from interruptions to perform unrelated tasks.

Of course there are some special operations in the questioned document field where the document examiner may have minimal control, for example, when he is caught up in a fast-moving investigation, and, perhaps, obliged to make examinations in the back seat of a squad car. Such work is difficult and important but I think not wholly devoid of opportunities to suggest to those who submit work that a complete and accurate report requires cooperation to establish the best conditions for the examination. The investigator or attorney may be a fine fellow and the best of company during free time, but he definitely should not sit at the examiner's elbow as he endeavors to finish an examination.

Some have said that document examiners (and other forensic scientists) should refuse to testify to a qualified conclusion, and this is the import of the McNally [*1*] and McCarthy [*2*] papers. This would seem to imply a mental reservation before examination that any opinion other than positive shall be reported in neutral language, which neutrality may be thought an effective bar to being called for testimony. Such a reservation would be contrary to an ethical view of the responsibilities of the document examiner to be impartial, to endeavor to solve problems by application of scientific principles, to follow the truth wherever it might lead, and to render an opinion or conclusion strictly in accordance with the physical evidence in the document [*8*].

Unless one has that rare type of mind that attains conviction in a flash, like intuition, each stage of belief depends on having passed through a previous lower stage. Just before the event "positive conclusion" the level of belief will have been "highly probable" or on a level susceptible of description by a similar term. While working from a base of highly probable and reaching for positive conclusion, one may come to know that a positive conclusion is not attainable from the documents under examination, so the highest level remains as highly probable. In like manner, when the level of belief is only probable and one is striving for a higher level it is by that striving that one learns finally that "probable" is the only assertion warranted by available evidence. Not only would it be unethical to conceal such levels of belief and the physical evidence on which they are based, it would also be deeply frustrating to the document examiner. In the long run, it seems to me that a habit or procedure for withholding disclosure of one's true state of mind would erode the power to make fine judgments.

When a specialist is engaged on an inquiry that starts with a single question, the natural processes of the mind create a chain of questions or a branching of questions, so that it would require some unnatural constriction at the moment of summarizing the results of the inquiry to act as though one narrow "yes or no" type of question had been held in mind during the whole inquiry.

There is no way to program a person's mind to remain blank until a positive conclusion appears; the mind is furiously active before that point. Formation of a conclusion is progressive. It moves from mere possibilities to probabilities, and to ever higher probabilities if there is evidence for them, and finally, with additional evidence, adopts the word "certainty" as a name for the highest probability attainable from a particular inquiry. If the mind does not reach a level that can reasonably be called certainty, it may rest at a level for which there is good reason to call probability.

Dewey [*9*] holds that one should not say "knowledge" but should say "warranted assertion," a term that points to evidence on one side of the equation and assertion on the other. He states further:

> There is no such thing as an instantaneous inquiry; and there is, in consequence, no such thing as a judgment (the conclusion of inquiry) which is isolated from what goes before and

> comes after. ... Every inquiry utilizes the conclusions or judgments of prior inquiries in the degree in which it arrives at a warranted conclusion.

Of course, the forensic scientist is not likely to adopt a strange term as a name for a conclusion given in testimony, but in making examinations one should seek precise names for operations performed and results attained. While the witness will prefer to utter a terse and vigorous conclusion before the jury, he or she must know that what is being done is to utter a warranted assertion which in its more complete form is, "I have developed a set of facts from these documents, which set I designate *X*. I have determined that this set of facts warrants an assertion or statement of a conclusion which I call *Y*, that is to say, *X* equals *Y*."

Hilton [*3*] cautions that the document examiner needs to analyze his position carefully when his examination leads to a qualified opinion. While this is good advice, it describes not more than one third of the document examiner's needs: he or she must carefully analyze the position when reporting a positive conclusion as well and must guard against the temptation to raise a conclusion justifiably stated in qualified terms to one stated, by a tenuous margin, in positive terms, remembering always that the quantity and quality of evidence that the documents yield determine the language for a conclusion, not the comfort or enthusiasm of the examiner, nor the preferences of attorneys or clients.

Positive statements draw less cross-examination than qualified statements, but when the evidence yields only a qualified finding it should be reported as the final result of laboratory work without qualms about possible later discomfort in the courtroom. It is not the function of the forensic scientist working in the laboratory to decide as a part of that laboratory work whether or not he or she will give testimony. The prime tasks are to discover and interpret facts and to form an opinion or conclusion as a summary of the facts or as an assertion warranted by the facts. Since facts about documents will vary in number and significance, it follows that the language selected to summarize different sets of facts must vary, some being in positive terms and some in qualified terms.

With a sensitive concern for the jury, Hilton [*3*] suggests a possible danger that testimony about probability may receive undue weight, that when the strong probability of an event is asserted the jury might believe the event to be a fact from the assertion alone. This describes an almost universal difficulty about communication: a person is sometimes misunderstood and a person sometimes misunderstands. This common experience is one of the reasons for having a jury of twelve individuals hear testimony of witnesses, so that, at the proper time, they may consult with one another about what was heard and what should be understood.

Each juror comes to court from a life filled with personal judgments about probability. Would not a juror be puzzled to hear only positive statements in a courtroom? Probability is a concept well within the juror's experience, so it is reasonable to believe that the juror is able to cope with it.

The understanding of the jury is the special concern of attorneys and of the court. Notable aids are cross-examination, redirect examination, rebuttal, and instructions of the judge. Expert witnesses must strive to make themselves understood. They cannot stand mute before the jury when called there by competent authority. If they have special knowledge about the documentary evidence gained by laboratory examination or otherwise they must respond to the questions of designated counsel and the court.

It has been said that we survive by taking risks. This does not mean that we survive by being reckless. It means that we survive by making judgments, even though we know that each judgment is attended by some risk of being wrong. This risk is variable, sometimes existing only because no human judgment can be deemed infallible.

From the moment a document is questioned there exists a risk that a wrong judgment may be made by someone. Society endeavors to establish ways for reaching the highest degree of certainty available from various lines of inquiry. With regard to documents one

of the ways is to assign the risk to persons who have been designated by the customs of society to submit themselves to a period of rigorous training and to seek meaningful experience, and then to accept the high responsibility (and modest rewards) of making correct judgments about documents. Some might say that the cautious, conservative document examiner could achieve a good reputation for apparent accuracy by refusing to state an opinion in all cases where there was not a warrant for a positive statement. However, the document does not exist just to produce a statistic for a right or wrong judgment. The document may often involve some question of the rights of persons—a question of justice. In its unanalyzed state the document carries the risk that a wrong judgment may be made by someone. The risk is very high for the inexperienced person, but it is much lower and may be almost nonexistent for the specialist. If the professional document examiner refuses to make a judgment, he or she must reflect that while the personal risk of being wrong has been avoided, the risk concerning the function of the document as an instrument for justice or right action is not diminished.

McCarthy [*2*] states that the only time a qualified opinion is justified is when the findings of the examiner do not go to the heart of the issue. There are several objections to this. It is not the business of the examiner to evaluate the nondocumentary evidence in the case to determine what the heart of the matter is. Examination and report are often made long before an indictment, well ahead of the development of other evidence that may show the heart of the matter. The conclusion, qualified or other, is given by the documents, not by something derived from the heart of the issue. The life of the document examiner's report may be coextensive with that of the document, and both may form a part of the basis for various actions without limit as to time. The report should not carry any caveat about its use in the heart of the matter or otherwise.

McNally [*1*] asks the question, "If the document examiner is somewhat undecided, why should this burden be laid at the feet of non-experts on a jury?"

If documents involved in the case on trial have been the subject of a laboratory examination wherein the evidence was described and evaluated and then summarized in a statement of probability, and if the document examiner is then called to the witness stand to give testimony in accordance with his previous examination and report, there is no burden to the jury. It is the very material they must consider in performing their duty to reach a verdict. The jury system would bear a greater burden if a rule should be established that jurors are not permitted to hear anything except positive assertions, because they would then be cut off from much useful testimony presented under a rule for allowing the jury to decide the weight to be given testimony.

McCarthy [*2*] says that we are already, in essence, dealing with probabilities when we render opinions, and he is correct in this. He then remarks that some examiners add the word "probable." This may be redundant but it is not error. The fact that an opinion or conclusion in one case is a report of probability regarded as equivalent to certainty is a warrant for reporting in other cases other states of probability, because the scale by which probability is judged is continuous, even though language is not capable of marking off the steps in very small divisions.

Let us say that we have before us a scale of probability ranging from certainty at one end to impossibility at the other. Shall the document examiner mark off a major segment of this scale and declare that he will not operate openly in that area, and that if he should be obliged to so operate by some exigency of an investigation, he will not report the results of that operation to a jury? This should not be so, because it is already well established that the expert may express qualified conclusions that are supported by good reasons.

The suggestion is made in the McCarthy paper that qualified conclusions are primarily of use to the investigator, not to the legal system. This has been answered in the last sentence of the paragraph above. Any conclusion, qualified or other, must be supported

by evidence, which is generally found to be smaller in quantity and lower in weight for the qualified conclusion. The jury is entitled to see that evidence and hear an expert evaluation of it.

Hilton acknowledges that testimony about qualified opinions is not necessarily a decision of the document examiner and then adds, "There are the problems of administrative superiors who require that the examiner appear in the case." To the best of my knowledge, no such problems exist. The circumstances that cause appearance of the document examiner in court are that an examination was made in the laboratory; a report was given in which evidence was adduced and a conclusion expressed, which report, or a summary thereof, came to the attention of a trial attorney who caused a subpoena to be issued or made an equivalent request for appearance. This statement is based on first-hand knowledge of federal government laboratories. Beyond that, I believe there are no laboratories devoted to private practice where administrative superiors require an examiner to appear in a case.

The document examiner's laboratory report is usually delivered to an investigator, attorney, administrative officer, or client, and from any of these points a further distribution of the report, or of a summary, may occur. Various actions may follow that distribution but the document examiner may not know about them in detail. One that must come back to the examiner, however, is the request, usually by an attorney, to appear in court to give testimony about the results of laboratory work. This does not mean that the examiner is a mere pawn. It means that the report must be evaluated in terms of its usefulness for serving the purposes of the law and it is right that this should be done by an attorney, who may also have the task of conducting the trial. Before that he must make decisions about what witnesses to call. It is customary that an examiner make a review examination before giving testimony. If his findings are in any way different from those originally stated, he must report them promptly.

McCarthy [2] states that a qualified opinion is no opinion at all since it is based on insufficient data. Should he not have said that when data are insufficient to warrant a positive opinion, the opinion must be qualified in order to show a correct relationship between opinion and evidence? To hold an opinion is a fact. When the examiner is asked to state the basis for his opinion he must refer to some fact or facts in a document. When asked about his reason for qualification he must again refer to some factual situation. The procedure is exactly the same for justifying a qualified opinion as for justifying a positive opinion, namely, statement of reasons. In other words, an opinion given as testimony is a starting point for talking about the evidence that brought about the opinion.

McCarthy asks the question, "How does the adversary party devise a test as to the reliability and validity of a 'probable' opinion and *show the expert to be wrong*?" [emphasis added]. McCarthy is a document examiner of long experience. It is strange that he should design a question so typical of the thinking of some attorneys, reflecting a view not that the expert is or may be right but how to show the expert to be wrong.

When a witness has given testimony about a document, whether as a positive or qualified conclusion, the witness cannot be shown to be wrong by the results of examining a separate test document. The jury's view of "rightness" concerning the evidential document is formed largely by the reasons given for the conclusion. Their judgment about reliability may involve several factors, but, again, consideration of the number and weight of reasons is the most important.

The witness can be right about the evidential document and may or may not pass a test on a prepared document, but it is well known that competent document examiners virtually always pass a fair test when it substantially duplicates the kind of problem about which testimony has been given and when a similar examination is permitted. The preparer of the test will know the fact directly. The examiner will rely on a different class of knowledge, that extracted from the test document. If the examiner hits the mark set by

the preparer's direct knowledge (which, presumably, he will have communicated to the court) or gives an assessment of probability close to the mark, he has passed the test, but, again, if he does not do so for that test (fairness is hard to achieve by an adversary) he has not been shown to be wrong about the evidential document. Competent document examiners come to the witness stand only after thousands of tests in their daily work.

McNally [*1*] speaks of "the semantic jungles of probability," and points to a part of the jungle he envisions by mentioning a "basic" element of "probable" as being "*not* proof" (emphasis McNally's). This is not basic but is narrowly selective. His authority, *Webster's Collegiate* (7th edition), gives eight words to say what probable means and two words to say what probable does not mean. The two words selected as basic may be in the *Collegiate* for the sake of abridgment, since the parent dictionary, *Webster's Third New International*, is more liberal, as shown by the following partial entry:

> [1]**prob·a·ble** ... [L *probabilis*, fr. *probare* to try, test, approve, prove + *-abilis* -able ...]
> **1a:** that is based on or arises from adequate fairly convincing though not absolutely conclusive ... evidence or support. ...

Let us consider a brief discussion of the concept of probability by a person well qualified to know its meaning and use, the late Morris R. Cohen, professor, City College of New York [*10*]:

> Judged by its indispensable role in our daily practical judgments as well as in the procedure of natural science, the concept of probability is one of the most important in the whole field of philosophy. ...
>
> We may, therefore, continue to speak of the probability of a proposition as an abbreviated expression for its probability relative to our total knowledge or body of propositions which serve as evidence for it.

It will be observed that the views of Cohen are closely similar to those of Keynes [*7*] given earlier. It appears that the uses of probability are widespread. I have put the question to many scientific workers, "How would your operations be affected if you were required to limit your conclusions to a positive or negative, giving up entirely the concept of probability?" The reply that far outnumbers all others is that effectiveness would be greatly reduced.

Summary

Useful conclusions about questioned documents result from the study and evaluation of probabilities, which are cumulative during the course of an examination and often lead to positive conclusions. Some documents fail to yield the full measure of evidence required for an opinion of the ultimate degree of certainty, and the document examiner must terminate some examinations at a point where he has a conclusion of probability, that is to say, where the matter has so much evidence in its support that it commends itself to the mind as worthy of belief. The conclusion of probability or warranted assertion, once made formal by incorporation into a written report or delivered orally as a part of a laboratory procedure, should become available as testimony upon request by competent authority.

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