THE

AMERICAN LAW REGISTER.

MAY 1879.

THE LAWS OF EVIDENCE AND THE SCIENTIFIC INVESTIGATION OF HANDWRITING.

THE magnitude of the interests involved in the use of written documents can hardly be overestimated, hence the necessity that they should be guarded as far as possible against falsification or fraudulent alteration. A mere enumeration of the many ways in which they enter into the complex relations of modern society would fill volumes, and would require years of study, ranging over the entire history of civilization to record. The preservation of property, character and life itself even, frequently depends upon the integrity of a few words recorded with a pen, and hence the various laws devised to prevent the falsification of writings and the necessity of some sure means of detection in such cases. That such crimes are alarmingly frequent at the present time, and becoming more common every day, cannot be questioned. This I think is more due to the inefficiency of the laws upon the subject, and the unscientific methods of investigation resorted to in many of these cases, than to increased skill on the part of those engaged in such crimes, or to the invention of new methods of working to the same end. Whatever may be the conclusion in this respect, however, it is certain that this class of crimes often escapes detection under the usual methods of investigation as prescribed by the courts, when the evidence is based mainly or as a whole upon that derived from the

visible characteristics of the documents themselves. Though no evidence will be deemed necessary in order to prove the fact, as it regards the vast number of crimes of this description which are brought to our knowledge every day, nevertheless I shall give in brief some account of a few of the cases which have been put into my hands for examination, as I shall have occasion to refer to them when coming to the proof of my proposition, that the present rules of evidence in such cases, and the usual methods of investigation recognised by the courts, so far from tending to prevent the occurrence of such crimes, on the contrary, serve to encourage them, by placing obstacles in the way of their detection. And this is eminently the fact as it regards the most skilful workers in this field of art; for where the result depends wholly upon the comparison of handwritings under the most liberal ruling of the courts, surely, the close resemblance of the work of the skilful forger to that of the writing in question, which is sure to deceive the most accomplished expert where the examination is made through the eye *alone*, or, indeed, by the aid of magnifying glasses without other appliances, would necessitate the giving of a positive opinion in his favor. And, it is this opinion which is called evidence and which the jury are expected to weigh in these cases. The lawyers themselves recognise the fact of the unreliable character of this class of testimony, in the common saying that they can prove anything by scientific witnesses. This is but declaring that under the rules of the courts they can and do get men to give opinions, or rather guesses, which they present to the jury as facts, and which are allowed to weigh as evidence. As those who make these rules are themselves lawyers, it would seem as if the responsibility of such a perversion of the very idea of justice should rest on their heads alone.

Surely, no scientific man, nor indeed any one who has the smallest claim to such distinction, were he to reflect for one moment, would allow himself to be used in such a manner. His guesses are of no more value than those of the unprofessional witness. If the expert should be, as he is, disgraced by lending his aid in any manner to such practices, what ought to be our opinion in regard to the courts and the lawyers themselves, who call such testimony competent, and allow cases to be proved and decided by this very class of evidence, which they stigmatize as wholly unreliable.

In no other "science" but that of the law, I submit, would such

methods of investigation be deemed of the least value. In medicine, which is often charged with being mainly dependent upon guessing, the field of investigation is left entirely open, and its methods are wholly unfettered by iron rules which preclude all true progress. The school of Salerno no longer prescribes the observance of the planets, in order to know the times and seasons for gathering medicines or for administering them. The weapon ointment is no longer used in cases of wounds, for the reason that Paracelsus or Sir. Kenelm Digby prescribed it. Nor would the decisions of Sir Tumley Snuffee or Mr. Justice Stareleigh have the least influence in fettering the investigations of any modern scientist outside of the field of the law.

I proceed, as necessary to my plan, to give in brief the rules of the courts as regards the examination of written documents; including under the term examination, whatever may be required or allowed to be done in such cases.

"The testimony of experts is receivable in corroboration of positive evidence, to prove that in their opinion the whole of an instrument was written by the same hand, with the same ink, at the same time:" *Fulton* v. *Hood*, 34 Penn. St. 365.

"All evidence of handwriting except where the witness saw the document written, is in the nature of a comparison. It is the belief which a witness entertains upon comparing the writing in question, with its exemplar in his mind derived from some previous knowledge. * * * * It is agreed that if the witness has the proper knowledge of the party's handwriting he may declare his belief in regard to the genuineness of the writing in question. He may also be interrogated upon the circumstances upon which he founds his belief. The point upon which learned judges have differed in opinion is upon the source from which this knowledge is derived rather than as to the degree and extent of it:" 1 Greenl. on Evid., § 576.

"There are two methods of acquiring this knowledge. The first is from having seen him write. It is held sufficient for this purpose that the witness has seen him write but once, and that only his name. * * The second mode is from having seen letters, bills or other documents purporting to be the handwriting of the party, and having afterwards personally communicated with him respecting them, or acted upon them as his, the party having known and acquiesced in such acts founded upon their supposed genuineness, or by such adoption of them in the ordinary business transactions

of life as induces a reasonable presumption of their being his own writings:" 1 Greenl. on Evid., § 577.

"This rule requiring personal knowledge on the part of the witness has been relaxed in two cases. First, where the writings are of such antiquity that living witnesses cannot be had, and yet are not so old as to prove themselves. There the course is to produce other documents either admitted to be genuine or proved to have been respected and treated and acted upon as such by all parties, and to call experts to compare them, and to testify their opinion concerning the genuineness of the instrument in question. Second, where other writings admitted to be genuine are already in the case. Here the comparison may be made by the jury with or without the aid of experts:" 1 Greenl. on Evid., § 578.

Before being admitted to testify as to the genuineness of a controverted signature, from his knowledge of the handwriting of the party, a witness ought beyond all question to have seen the party write or be conversant with his acknowledged signature. The teller of a bank, who as such has paid many checks purporting to be drawn by a person who has a deposit account with the bank, but has not seen him write, if the testimony shows nothing further, is a competent witness to testify as to the handwriting of such a person; but he is not a competent witness to testify to the handwriting of such a person if it appears that some of the checks so paid were forged, and that the witness paid alike the forged and genuine ones: *Brigham* v. *Peters*, 1 Gray 139, 145, 146.

A witness who has done business with the maker of the note, and seen him write, but only once since the date of the disputed note, may nevertheless give his opinion in regard to the genuineness of the note, the objection going to the weight and not to the competency of the evidence: *Keith* v. *Lathrop*, 10 Cush. 453.

A third mode of acquiring a knowledge of a person's handwriting is by putting writings acknowledged to be his in the hands of the witness and allowing him to study them and thus become acquainted with the handwriting; and as the result of such study he is in some states, though upon this point there is a conflict, admitted to be competent to testify as to the case in question; that is, to examine the document in the case and to give his opinion as to its genuineness. See the authorities, collected in 1 Greenl. Evid., § 579–581, and notes.

The reasons for refusing to allow such comparisons of handwrit-

ings are: 1st. The danger of fraud in the selection of writings offered as specimens for the occasion, or if admitted, their genuineness may be contested and others successively introduced, to the infinite multiplication of collateral issues and the subversion of justice: 1 Greenl. Evid., § 580.

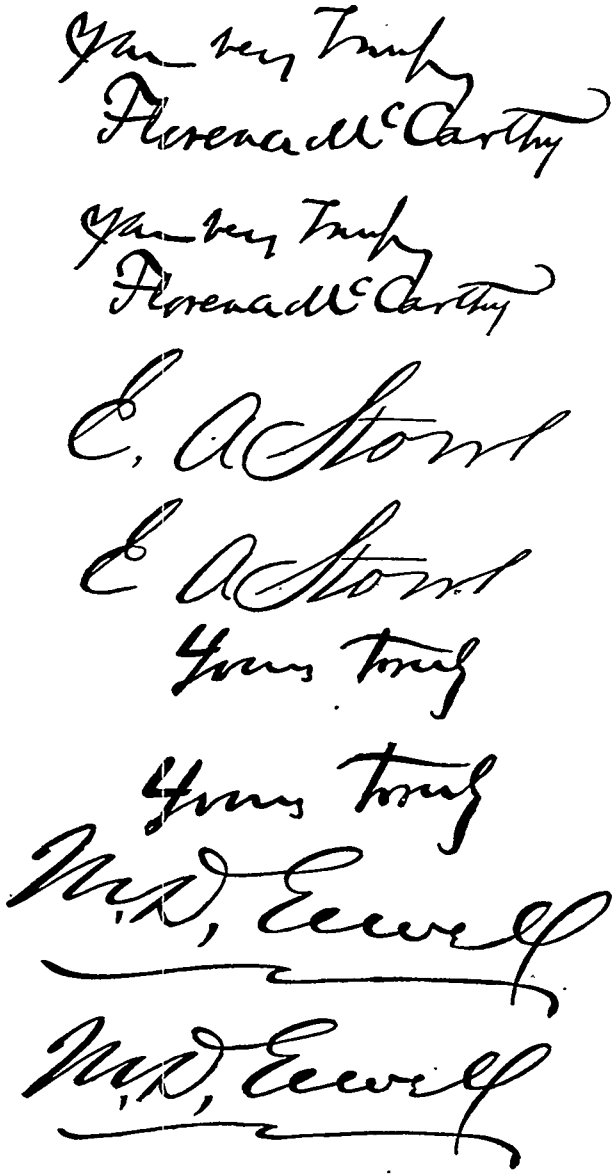
I next proceed to quote other learned authorities on this part of my subject, some of them opposed to the rules, but all resting upon the false idea, as I conceive it to be, that *opinions* based upon a comparison of handwritings as a question of resemblance or non-resemblance in form alone should have weight as testimony in courts of justice. The more close the likeness the more danger is there, of course, of coming to a false conclusion, and herein lies the danger, as I have illustrated more fully in another part of my paper. Again, there is as great difference in the ability of persons to recognise variations in form as there is in the power of distinguishing color. Many persons are *form*-blind as well as color-blind, and of this they are, of course, themselves unaware hence, perhaps, in many cases the conflicting testimony of witnesses in this respect. Were they required to give reasons for their opinions in such cases, the discrepancy would be self-evident.

This rule would not include such comparison as a means of showing points of difference in handwriting, where such points of difference were made use of by the expert, in connection with other facts which, on account of their relation to each other and to these first also, might help him to come to a conclusion.

"Evidence of handwriting, like all *probable* evidence, admits of every possible degree, from the lowest presumption to the highest moral certainty, and affects the jury accordingly:" 21 Ill. 415, per BREESE, J.

It will be seen that this dictum is based upon the idea that such evidence is deducible from a comparison of handwritings, as before explained, which, as I have said before, is less conclusive in those cases where the samples compared most resemble each other; for the expert forger, as has been frequently proved, finds but little difficulty in producing *fac similes* of the writings he wishes to imitate; and of course, the so-called expert, in these cases, under the usual methods of examination, can only testify that in his opinion such specimens are genuine. Thus the highest "moral certainty" of the learned judge (and I submit of the courts generally), becomes the strongest physical uncertainty, so that when the court and jury were most affected in this direction, there would be the greater

reason to doubt, or at least to make a thorough scientific examination of the writing in question.



I give, as an illustration of this statement, engravings from the handwriting of three well-known citizens of Chicago, and also imi-

tations of the same. One of each is, of course, from a genuine specimen and one from an imitation. They have been photographed directly on the wooden block, and are hence perfect *fac similes* of the originals. The imitations were made somewhat different in size from the genuine ones, in order to show that they have not been traced from the originals. It would be impossible in this case for the most skilful expert, or for the authors of the signatures themselves, to tell the true from the false by means of any method of comparison ordinarily used in the courts, or indeed, by any recognised by the authorities. Still, there is a way by which the true originals could be told from the false with the utmost certainty, and the fact demonstrated so as to be understood by the jury.

"All evidence of handwriting," the judge goes on to say, "except when the witness has seen the disputed document actually written, is in its nature comparison."

"It is only the belief which a witness entertains upon comparing the writing in question with an abstract picture in his mind, derived from some previous knowledge, and he must upon the moment apply that picture or example to the particular writing in question." The exception here laid down in regard to the document not being subject to the same law of recognition, provided the witness saw it written, seems to me not to be quite correct, unless the document had remained in his keeping up to the time of its presentation. He could only recognise it by comparing it with the abstract picture in his mind, painted there at the time it was written, and this same statement would hold good had the document in question been the work of his own hands. It is as necessary to the success of the forger that he be able to bring all parts of his falsified paper in apparent harmony with his model, as that the writing itself should be in the same condition, and this is very often done, and is indeed much less difficult of accomplishment under the rulings of the court than the falsification of the writing itself even.

I have had case after case of the kind where the parties themselves, who had made documents for the express purpose of testing this fact, failed to distinguish between the true and the false; not from the comparison as expressed above of the similated papers with the image remaining in the mind, or recalled by memory alone, but by the actual presence and comparison of the true and

the false documents with each other. From these facts alone I think we should be warranted in coming to the conclusion that testimony based upon the resemblance or non-resemblance of handwriting, joined with the evidence deduced from the external appearance of the documents, is, if we go no further, of no kind of value whatever, and that we should oftener get justice in such cases by resorting to the old method of settling doubtful questions by casting lots. Indeed, it seems to me that the present system, like loaded dice, is vastly in favor of the expert forger, if not also of the mere beginner or bungler in the art.

In the continuance of his comments upon the rules of the courts in respect to the comparison of handwritings, Judge BREESE goes on to say, "It has been already stated, that a witness who testifies on the subject of a handwriting, gives at best but the result of a mental comparison made by him of the disputed writing, with that which he has seen, and the impression of which remains in his memory. "What difference could it make if this comparison was carried on in the mind, which the rules of evidence allow, or was actually made in the presence of the court and jury? Is speaking from an impression made on the mind more convincing, more worthy of regard and belief than a present conviction produced by actual comparison?" In Pennsylvania, in *Farmers' Bank* v. *Whitehall*, 10 S. & R. 112, the court, in discussing the matter, say, "It is more satisfactory to submit a genuine paper as a standard and let the jury compare that with the paper in question, and judge of the similitude, than the evidence continually received of allowing a witness who has seen the party write once, to compare the disputed paper with the feeble impression the transient view of the writing may have made upon his memory."

In a recent English case, 4 Phil. Ev. (Cow. and Hill's notes), part 5, p. 478, it is said, "Why is it not as reasonable when a doubtful paper is sought to be made evidence that the opposite party should show by a genuine paper and by a comparison of a disputed paper with it that the probability is against its genuineness?"

The arguments in favor of the rules of the courts it will be hardly necessary for me to notice. They all of them seem to me of as little value as the first mentioned, which contains in its very proposition its answer, *e. g.*, where *genuine* papers are brought forward for comparison, &c. Objection. "The danger of admitting fraudu-

lent ones; of course no paper should be used for the purpose which would not be admitted by all parties to be genuine. No comparison of the kind would be of the least scientific value exeept under such conditions.

"1st. The testimony of experts may be received to prove that an instrument was written by the same hand, with the same ink, and at the same time." Suppose every latitude should be allowed in such a case, still, under the received methods, if the paper should be skilfully executed, the witness is pretty sure to come to a wrong conclusion. If he guess at the matter, or is governed by his prejudices, which is very apt to be the case, his statements surely ought not to be received as evidence. It is very easy so to prepare ink, and this is constantly done, that it may appear to the eye to be of the age required. Microscopical and chemical tests may be competent to settle the question, but *these* should not be received as evidence, I think, unless the expert is able to show to the court and the jury the actual results of his examination, and also to explain his methods so that they can be fully understood. Surely, in matters involving such important questions, this is not too much to demand of the scientific witness, and he will as surely court such test if he have the least self-respect or regard for the honor of his vocation.

The investigations under this rule have been, heretofore, usually made by the eye, sometimes aided by optical instruments, which are like edge tools in the hands of unpracticed persons; sometimes with chemical reagents, which in the present state of the science, can tell nothing in regard to the age of writing, but can tell sometimes as to the kind of ink. The practice has been, and still is, to call on both sides professional experts and others who have seen the party write, or are qualified in either of the ways described, to give an opinion upon the question at issue, and such opinions are to go to the jury as evidence which they are to weigh, say the court, and the value of which they must estimate as one end or the other of the scale shall preponderate.

Is not this the veriest farce and mockery of justice imaginable? and would not drawing lots, as I have suggested, be far better, as it would be more expeditious and much less costly? If we desire authority for this last method of deciding cases, we have such authority, much older than that of the Romans, which is so often quoted. "The lot causeth contentions to cease and parteth between the mighty." Prov. 18: 18. It will be seen that I object entirely

to those persons being called experts in any case who have not prepared themselves to give scientific testimony (in the full meaning of the word science, *e. g.*, knowledge certain and evident); not only in cases involving the validity of written documents, but wherever the nature of the case is susceptible of this class of evidence.

I use the word opinion in this discussion in its legitimate sense as used in the courts, *e. g.*, "an opinion is an idea or thought about which doubt can reasonably exist, as to which two persons can without absurdity think differently." Out of this system of admitting opinions as testimony in courts of justice, it seems to me, has grown the practice of heaping up such testimony in a certain class of cases, and also the efforts to impose upon the jury by numbers of witnesses, or by some fancied superiority of one witness over another, through the quackery of sounding names or titles, or of *ex cathedra* authority on the part of such witnesses. At a recent trial, a so-called expert was asked what offices he had held which gave him a right to such title. He replied, "I was president of the State Microscopical Society; I am president of the Academy of Sciences," and this statement was pleaded as good reason why his opinion should have great weight in deciding a question of handwriting.

In a recent case involving a large sum of money, in which the writer was engaged, the facts of the individuality of the handwriting, identity of ink and time, were all required as evidence. Here some ten witnesses, experts and others, were sworn on each side; some actually stating that they had seen the signature of the endorser (which alone gave the note any value), affixed to it by his own hand. This note purported to be nearly six years old. It was written with two different kinds of ink, and the writing, though having a somewhat faded appearance, still was perfectly legible, so that I had no difficulty in making a copy of every letter, and of getting one also by the photographic process. Upon making a micro-chemical examination of the ink, I found it was quite fresh, and moreover, that both kinds used were of such a nature as to grow old rapidly, as seen by the unaided eye, or under direct light, when viewed by aid of the microscope.

Here the experts and other witnesses swore as positively in favor of the sides on which they were employed, as is the usual fact in such cases, and the court remarking that "no court in the wor d

had to do so much guessing as this court," decided in favor of the genuineness of the note. The case was appealed, and a year elapsed before it came to trial. At this time, when the paper was again presented for examination, many letters and several whole words, even, had become totally illegible, thus confirming the conclusions to which I arrived on my first examination, that it could at that time have been but a few months or weeks old. The very astuteness of the skilled forgers in this case contributed to their defeat; they having selected, or more probably made, these inks themselves for the very purpose that they might rapidly grow old in order to appear so when presented for payment.

There is another point of view from which I desire to notice this case. It was carried in the first instance, as said the court, by guessing, or by the balancing of the opinions of experts and others, based upon the comparison of handwritings, under the rulings of the courts. My own testimony was not admissible in this respect, as I had never seen the endorser of the note write. I had in my possession hundreds of documents of his, consisting of checks, notes, deeds, etc., of which I had made most careful examinations, and yet I was not sufficiently acquainted with his handwriting to give an opinion in the case; while a mere laborer in his employ, who had once seen him sign his name when receipting a bill, was fully competent to testify, that is, to give an opinion in the case.

I should remark that the rule which precludes papers not in the case from being used for the purpose of comparison, is not binding in some of the states nor in the Federal courts.

There are certain methods of examination fairly coming under this head, not, however, contemplated by it or by any other rulings of the courts, which I should deem conclusive. One of these methods I have alluded to in connection with the specimens I have given in the engraving; the other is embodied in the study of the anatomy or skeleton, so to speak, of the handwriting. By the anatomy of the writing, I mean the principles on which the letters are formed. This not unfrequently consists of an undermarking or skeleton which may not appear to the eye, but which constitutes an absolute distinction in style. This can best be illustrated by an actual case.

Thus, an alleged forged agreement was brought into court, in which it was admitted that the body of the instrument was written by the party claiming under it, while the signature, it was con-

tended, was in the handwriting of one member of the firm, against which the claim was made. There were quite a number of witnesses who testified to their belief of the genuineness of the signature, one of them being a so-called expert, while as many from the same data gave contrary opinion. I found upon an examination of the document, that the anatomy of the handwriting of the signature was quite different from that of the alleged signer, while the signature itself and the writing in the body of the paper agreed in this respect, that is as to its principles of structure; one party writing in what I call the looped style, that is, making a looped letter whenever practicable, while the other, in every case where it was possible to do so, avoided any such form of letter.

To illustrate, one would make a capital  thus, by beginning the first stroke of the letter near the ruled line on the paper, forming a curve to the right, then carrying the pen upward toward the top of the letter, thence backward to the left, then downward across the first stroke, forming a loop in the process; next on reaching the line forming another loop by carrying the pen backwards to the left and upwards across the last line to the top, and then repeating the motion used in the first downward stroke in forming the last limb of the letter. Thus making the capital M with three loops, one at the bottom on the ruled line, and two at the top, and this was the fact in all this person's writing where it was possible to introduce a loop. In many cases these loops were made so narrow as scarcely to be noticed by the unaided eye, the two lines of ink uniting and forming a continuous line, yet under the magnifying glass the skeleton of the letters could be clearly seen, showing the principle on which they were constructed. When this party wrote with a pencil this looped structure of his letters could be clearly seen.

The other writer, the author of the document in question, would make the letter  thus, beginning it as the first described on the ruled line, then carrying the stroke upward to the top, from thence making the downward stroke directly on the right hand side of the first, forming an acute angle with this line, and so of the rest of the letter, which when finished showed three acute angles when the other showed three loops. This I will call the acute angular style, as it was characteristic of the whole document.

This contrast in the anatomy of the two styles of writing as surely shows that they were of different origin as would have been the fact in the old fable where the ass personates the lion by clothing himself in a lion's skin, could the observer having the two animals before him have looked through their skins to the skeletons beneath.

In a case in a commercial house where an embezzlement to a considerable amount was discovered, the alterations which were made in order to conceal the fraud were seen to be *fac similes* of the handwriting of one of the two clerks who kept the books. These alterations, however, might have been made by the other clerk, he imitating the handwriting of the first, in order, in case the fact was discovered, to clear himself by casting suspicion upon his fellow clerk. The question thus submitted without other testimony would seem to rest for its decision upon a comparison of the handwritings alone. This, as I have already shown, might work the greatest injustice in a case like the present, confounding the innocent with the guilty. The altered words and figures were to all appearance, in every respect like the handwriting of one of the parties, as before stated. Upon examining the principles upon which they were formed, a perfect correspondence was seen to exist here also, while upon a similar examination of the writing of the other clerk a very marked difference was observable, and much of this difference could only be seen through the aid of the microscope; hence I felt warranted in coming to the conclusion that the alterations were the work of the clerk whose handwriting they so closely resembled. It is possible, perhaps, to imitate a handwriting by the very means and in the very manner in which the original was executed. But this would, of course, necessitate the use of the microscope in the first place, and a good deal of after practice in order to its successful accomplishment. If it should occur in a given case and there should be no other means of detection, the expert would have no right to come to a conclusion, as it would in such a case be no better than guessing. I use the word "conclusion" in this paper in the sense of a necessary consequence, that is, to the mind of the expert. And under these conditions he might perhaps be allowed to state his conclusions to the jury, but not in this case or any other, without at the same time being called upon to give the grounds of such conclusions.

Another case which took place in an adjoining state, still further

illustrates the value of this method of examination, and also of that usually resorted to in such cases. This case involved th forgery of five separate notes, all purporting to be endorsed by one party, this endorsement alone giving them any value. This gentleman, the alleged endorser of the note, was quite aged, and wrote a very fine, tremulous hand; viewed by the unaided eye the imitation appeared almost perfect, and was sworn to by those persons whom the law in this state recognises as competent witnesses in such cases. On making a magnified copy of this signature, I found that the tremulous appearance of the letters was due to the fact that they were made up of a series of dashes standing at varying angles to each other, and further, that these strokes, thus enlarged, were precisely like those constituting the letters themselves in the body of the note which were acknowledged to have been written by the alleged forger of the signature. Upon the introduction of this testimony, the criminal withdrew the plea of not guilty and implored the mercy of the court.

In reviewing these cases it will be seen that any number of competent witnesses, and a majority of them I do not doubt, perfectly honest in their opinions or guesses, can be got to testify on either side of the question, well illustrating the value of this class of testimony.

"The teller in a bank is a competent witness when he has paid the checks of the party whose handwriting is involved in the question, provided he has not paid forged checks purporting to have been made by such party, this renders him incompetent." He would be competent, however, no matter how many such checks he may have paid, provided he has seen the party write once, and then only his name.

An expert may be called upon to testify as to which writing was made first in cases where the pen strokes are seen to cross each other. This is sometimes a most important matter, as upon such testimony the decision of a case may wholly depend.

In two recent cases, the possession of property to the amount of more than half a million dollars was determined by such a fact. From the investigation which I have made, I cannot doubt that in nearly all the cases of this kind, as well as where the age of documents has been decided, or the testimony in regard to this fact at all influenced, by their appearance alone, even when a magnifying glass has been used, that such decision has been based entirely upon

guessing. In one of the cases referred to above, the signatures were written with different inks, the letters in one crossing the other. The question to be decided was the order of sequence in the writing. To the unaided eye, and under the use of magnifying glasses also, one ink showed very clearly over the other, and had I been obliged to decide the question on such data alone, I could have come to but one conclusion, and this as it proved, would have been the wrong one.

I was able to demonstrate the facts in the case by wetting a piece of paper with a compound which acts as a solvent of ink, and then pressing this paper upon the writing in question, whereby a thin layer of ink was transferred to the prepared paper, at once settling the matter in dispute by showing which was the superposed ink.

As a result of my experience in this case, I was led to make a series of experiments with reference to determining this one fact, though, as in all such cases, others came up which helped to determine still others.

I took for the purpose of my experiment ten of the most common kinds of ink found in the market, and drew a series of lines, three in number, with each kind of ink, across a sheet of paper. This was followed by a similar series drawn diagonally across the first, thus forming a hundred points of crossing, and placing each kind of ink above and also under all the others. In thirty-seven cases out of the hundred, the eye, with or without the glass, saw the under ink as if it were on the surface; in forty cases nothing could be decided in this respect; the balance told the truth of the matter. By the other method, that is, by the use of the solvent, the true facts could be made plain in every one of these cases. This experiment, as will be seen, was made with ten kinds of ink more or less differing from each other in color and in chemical composition, and it certainly proves that all such testimony, as I have said, has been thus far no better than guess work.

But suppose the same kind of ink is used in a given case, here other methods of investigation must be resorted to.

The question may be determined as I was able to determine a similar one in the case of the *City of Chicago* v. *Gage et al.*, where the first strokes of the pen, forming channels as it were, and disturbing the size on the paper, allowing the ink in the crossing lines to flow out to some distance in these channels, thus causing there a double thickness of ink which was clearly visible to the naked eye.

There may be circumstances in these cases, preventing this outflow of ink; or if it does take place, so mingling the ink in the crossing lines as to hinder the fact from being seen. Again, it might be determined by settling the question of age by chemical and other means applied to the writing itself.

If all these resources fail us we can then, under the rulings of the courts, resort to the usual method of forming an opinion through the process of guessing.

In a case where the validity of a note depended upon the fact whether the words and figures constituting the date of the endorsement were written at the time with the other words of the endorsement, I was able to decide the question by showing that they were not only more recent, but that they were written with a different kind of ink. The party swore that after having written the words constituting the assignment of the paper, he noticed that he had not dated it, and that he "then and there, with the same pen and with the same ink wrote the date over the other words." I was able to confirm my conclusions in this case, through experiments for ulterior purposes, by means of the photographic process. I had a photographic copy of the writing made in order to compare it with that on the inside of the instrument. The photograph not only copied the forms of the letters in this case, but it also took notice of the difference in color of the two inks, thus confirming the accuracy of my own deductions.

The photograph is able to distinguish shades of color which are inappreciable to the naked eye; thus, where there is the least particle of yellow present in a color it will take notice of the fact by making the picture blacker, just in proportion as the yellow predominates, so that a very light yellow will take a deep black. So, any shade of green, or blue, or red, where there is an imperceptible amount of yellow, will print by the photographic process more or less black; while either a red or blue, verging to a purple, will show more or less faint, as the case may be. Here is a method of investigation which may be made very useful in such cases, and which will give no uncertain answer. Indeed, its testimony may be said to amount to a demonstration. Greenleaf, in his work on Evidence, vol. 1, sec. 1, says, "none but mathematical truth is susceptible of that high degree of evidence called demonstration, which excludes all possibility of error." In spite of this dictum I have used the word demonstration several times in this paper, and as I hold that

scientific testimony which does not amount to a demonstration, should (in that class of cases susceptible of scientific accuracy), have little weight in a court of justice, I wish to bring it to a still further test. In a paper involving some thousand dollars, an alteration had been made, which, as was alleged, entirely changed the direction in which the property was intended to be bestowed by the maker of the paper. The alteration was admitted, but was sworn to as having been made by the original party immediately after writing the paper, he himself being dead at this present time, and the only living witness being the one so attesting.

This witness swore that the party "then and there," as in the case before quoted, "made the alteration at the same time and with the same pen and ink with which the other portion of the paper was written;" he added that "there was only one kind of ink in the room at the time." Upon examination I found that all of the paper, with the exception of that part where the alteration was made, was written with an ink composed of nut galls and sulphate of iron, while the other ink was made of analine and Prussian blue. Does it not amount to a demonstration that the whole paper could not have been written with one and the same kind of ink? This is certainly in accordance with the received definition of the word, *e. g.*, demonstration, the exhibition of one truth as the consequence of another, &c.

The proof of the age of a document which is sought to be established by the appearance of the paper is, if possible, less reliable than by the comparison of the handwriting by the ordinary methods. I have repeatedly examined papers which have been made to appear old by various methods, such as washing with coffee, with tobacco-water, and by being carried in the pocket near the person, by being smoked and partially burnt, and in various other ways. I have in my possession a paper which has passed the ordeal of many examinations by experts and others, which purports to be two hundred years old, and to have been saved from the Boston fire. The handwriting is a perfect *fac simile* of that of Thomas Addington, the town clerk of Boston two hundred years ago, and yet this paper is not over two years old.

It will thus be seen that in my opinion, under the present rulings of the courts, there is no species of evidence less to be relied upon in regard to the genuineness of documents than that furnished by the (superficial) examination of the documents themselves, and

that this is wholly due to the methods of examination, and not in the least degree inherent in the nature of the subject itself. Such are the iron rules which govern these investigations, and so unwilling are scientific men in most instances to subject themselves to the ignorance and bigotry of unprincipled lawyers, that they avoid, so far as possible, having anything to do with such matters, and therefore, the name "expert" has got to mean anything other than what the term implies. Witnesses, if dishonest, will be governed by their interests; if honest and ignorant, by their prejudices; and thus, of course, both classes testify on the side which employs them, and as they can only give an opinion, which opinion at best is merely a guess, a trial merges itself into a thing of management, in which the most skilful strategist gains the victory. The jury are instructed "to weigh the evidence," and as they have no philosophers' scales in which mountains could be balanced against atoms of sense with which to perform the act, each party strives to make it appear that he has the greater weight of evidence on his side; hence the imposition of high-sounding titles; and, as I have noticed before, the introduction of all that class of management which strives to make the lesser reason appear the greater, and thus impose upon the jury. If the witness chances to be both intelligent and honest, the condition of things is no better; for, as I have shown before, he can only give a mere guess in any case under the existing methods in some of the courts.

I have said that the present unreliability of this class of testimony is not inherent in its nature, but under proper rulings, scientific witnesses (and these alone should be employed where the investigation is of a scientific nature), would be able to give absolutely reliable testimony in many cases, and where they were not able to do so they would state the fact, and thus remove all elements of guessing from this class of evidence. Further, the scientific witness should be allowed, indeed, should be obliged, as I have said before, to show and explain as far as possible the methods by which he arrives at his results. Thus, where a paper had been wet by a solution of tannic acid, for a fraudulent purpose, it was easy to show the fact by touching the yellowed paper with a solution of sulphate of iron, when the trick was at once made evident by the dark discoloration of the spot where the fluid was applied. The opinion of experts, and of all who saw this paper, was that the writing was very recent, on account of its fresh appearance. This