

**PAPER****JURISPRUDENCE**

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## Weakening Forensic Science in Spain: From Expert Evidence to Documentary Evidence\*

**ABSTRACT:** An amendment in 2002 to the Spanish Code of Criminal Procedure converted into documentary evidence the expert reports prepared by official laboratories aimed at determining the nature, weight, and purity of seized drugs. In most cases, experts are spared from appearance before the courts. This is likely to be extended to other forensic fields. After an overview of criminalistic identification in current forensic science, the objectivity and reliability concepts used by jurists and scientists are considered by comparing the paradigm of individualization with that of likelihood. Subsequently, a detailed critical study is made on the above-mentioned Spanish legal reform, and a comparison is made with the decision on the *Melendez-Diaz v. Massachusetts* case as ruled by the Supreme Court of the United States. Although the reform is in compliance with the Spanish Constitution, it is at odds with science, in particular regarding the logic underpinning the scientific evaluation of evidence.

**KEYWORDS:** forensic science, evaluation of evidence, documentary evidence, likelihood paradigm, individualization paradigm, accreditation, objectivity, reliability, transparency, testability

The so-called traditional fields of expertise in criminalistics such as latent print comparison, firearms, and tool mark comparison and handwriting examination, which have played an important role in many relevant criminal cases in all countries, have spread the use of categorical concluding statements on identity in expert reports. The untested claim that a forensic practitioner can link an unknown mark to a unique source, a faulty probabilistic intuition equating infrequency with uniqueness (1), has been a key determinant to achieve convictions, as prosecutors and law enforcement agencies have relied on reporting results including categorical statements about identity to base their theses.

In Spain, the Supreme Court considers it sufficient to establish the identity of a person by the comparison of latent prints with known fingerprints when forensic experts report eight or 10 common minutiae (the disjunction or is literal), for example, equal topography (minutiae set in the same places) and morphology (types of minutiae), and ridge numbers between minutiae. Besides, there should be no natural dissimilarity between the latent print and fingerprint being compared (Spanish Supreme Court [henceforth, SSC] case law, e.g., see sentences: 15/06/1988, Ar. (Ar. stands for Aranzadi) 5024; 04/07/1988, Ar. 6477; 25/11/89, Ar. 9319; 04/07/1990, Ar. 6220;

15/03/1991, Ar. 2156; 02/12/1992, Ar. 9903; 02/11/1994, Ar. 8382; 04/11/94, Ar. 8563; 18/09/1995, Ar. 6379). In the case of several latent print/fingerprint comparisons from the same person, the Supreme Court acknowledges a greater degree of certainty on identity (SSC case law, e.g., see sentence: 25/11/1989, Ar. 9314). This was a consequence of the way Spanish forensic experts had defended fingerprinting evidence in court in years past, which was considered highly effective by crime investigators. But it is a paradox that such a ruling, which determines the limits of reasonable doubt in fingerprint identification, could be used to wrongfully involve innocent people (2). Individualization is still the key task of many forensic experts in the majority of countries worldwide.

Many scientists and commentators have refuted the individualization paradigm for decades from philosophical, logical, and statistical standpoints (1,3–9). As Jaynes (6) wrote in a quote which he attributes to Jeffreys (4): “The role of induction is not to tell us which predictions are right, but which predictions are indicated by our present knowledge ... Moreover, it is only when the inductive inferences are wrong that new things are learned about the real world” (p. 326). It is important in forensic identification to be aware of the role of induction in science and, consequently, the role of statistics.

On the other hand, forensic identification fallacies, such as the often published prosecution fallacy, continue to be either unknown or misunderstood by some forensic experts, prosecutors, and judges all over the world (7). Very different reactions have been noted, especially among European countries and their laboratories (e.g., Norgaard A, Ansell R, Jaeger L, Drotz W. Ordinal scales of conclusion for the value of evidence. Presentation in the Interpretation and Evaluation Session of the V Conference of the European Academy of Sciences held in Glasgow, University of Strathclyde; 8–11 September 2009), from the time scientists and statisticians began explaining and publishing those fallacies in scientific journals and

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books. For example, after years of internal debate, in 2009 the Swedish National Laboratory of Forensic Science (SKL) announced its decision to unify the manner conclusions are drawn in evaluative comparisons, regardless of the fields of expertise involved, in order to provide the same kind of information to courts whatever the type of evidence analyzed. However, many other laboratories have barely reacted or are awaiting superior orders, as is the case of Spain.

There shall be a focus on the role of science in the evaluation of evidence by forensic experts and its implications on Spanish law. Other important roles of forensic science such as investigative or intelligence tools are omitted. Questions such as “What does scientific methodology consist of?”; “What methodological requirements should be asked in any forensic report?”; “What does objectivity mean in science (10–12)?”; “How should data obtained from experiments or observations be interpreted as evidence (5)?”; “What is the role of forensic experts evaluating evidence (7)?”, as well as many others, do not have simple answers. To quote from the National Research Council (13), in the Reporting Results Section, it is absolutely necessary “to provide the essential building blocks for the proper assessment and communication of forensic findings” (p. 6–3). There will be some mention of how the accreditation and suitable statistical interpretation of scientific evidence are pillars to guarantee the reliability requested by courts and crime investigators in reporting results.

Differences between the judicial and scientific contexts with respect to essential aspects of science applied to solving criminal cases will be shown. The massive, ever increasing number of requests for expert reports received by official laboratories and the chronic lack of human and material resources have led to the following measures designed to speed up criminal proceedings: defense of forensic reports by videoconference; the presence of only one expert before the court in certain types of proceedings and also, legal reforms in Spain. An example of the latter is the addition in 2002 of a second paragraph to Article (Art. from now on) 788 of the Spanish Code of Criminal Procedure (henceforth, LECrim) converting expert evidence on the determination of the nature, amount, and purity of the drugs seized into documentary evidence (14). Since 2002, based on foregoing legal amendment, some sentences passed by different Spanish courts applied the analogy of drug examination, that is, the consideration as documentary evidence to other forensic fields. Consequences of such judicial change are relevant in evidence interpretation as well as in the work of courts, prosecutors, and lawyers. Needless to say, this reform was carried out without previous scientific debate.

Whether by means of case law or legal reform, the many years of work by Spanish official forensic experts in fingerprint comparisons or drug examinations are finally acknowledged to be “scientifically reliable.” Whereas on the one hand, for instance, in the United States (13) or United Kingdom (15), technical committees are appointed to provide professional advisory documents for law commissions before discussing bills related to giving expert evidence in Courts in Congress or Parliament, on the other hand, in Spain, the priority is given to the official forensic experts’ independence. The official character of forensic experts and the fact they belong to public institutions afford the courts a guarantee of scientific competence; for this reason, controversies such as those that recently happened in the United States are simply unthinkable.

Undoubtedly, it is relevant to determine the causes of the controversy (16–19) and to contribute proposals about how efficient procedural justice can be made compatible—without changing the true nature of evidence in criminal proceedings—with a rigorous scientific method used in presenting conclusions in forensic reports. In

Europe, the history of the so-called voiceprint methodology, for example to recognize people by voice, could be reproduced again in many forensic fields in the absence of a previous controversy. The National Academy of Sciences (19) of the United States published a technical document in February 1979, previously requested by the FBI, which set out to analyze the scientific bases of such a methodology. Once published, the FBI decided against its use in making categorical identity statements. Nonetheless, other voiceprint experts in many other countries continued to use such statements. In other words, the opportunity to strengthen forensic science in the United States and beyond could be lost if the need to establish the fundamentals of the scientific method as applied to forensic practice is ignored.

The structure of this paper is as follows: first, an overview is provided on criminalistic identification to help put the Spanish case in a global context, establishing what is happening nowadays in forensics all over the world; second, the role of science in criminalistic identification pointing out the discussion in these three words: objectivity, transparency, and testability; third, a detailed analysis of the Spanish legal reform wherein expert evidence is transformed into documentary evidence, together with the implications for the interpretation of evidence in courts by experts; fourth and last, some opinions and possible solutions that would enable compatibility between Spanish legal reform objectives and the specific demands of science.

### **An Overview of Criminalistic Identification**

The criminalistic environment is extremely complex. It involves both private and public laboratories, with the latter including public institutions belonging to ministries or governmental departments of interior, justice, health, customs, commerce, treasury, defense, and others (i.e., law enforcement agencies, secret services, prosecutor offices, forensic medicine, or toxicology institutes, among other possible ones). The so-called Fragmented system in the United States (13) is not far away from what is happening in the rest of the world. In Spain, there are five laboratories that belong to the European Network of Forensic Science Institutes (henceforth, ENFSI), two of them are dependent on the Ministry of Interior (National Police and Guardia Civil), two on regional governments (Ertzaintza in the Basque Country and Mossos d’Esquadra in Catalonia), and another one on the Ministry of Justice (Toxicology and Forensic Sciences). There is hardly any technical coordination between them on forensic report interpretation, and even different departments in each laboratory report their findings differently.

However, while commentators were already warning in the 1980s and 1990s (20–23) about the need to avoid “fallacies” or pitfalls when forensic experts assessed analytical results, nowadays these “fallacies” are ignored, more or less consciously, in quite a few laboratories of many countries (7,13). The individualization paradigm (1) continues to be widely spread, and categorical statements in reporting results are supported by many forensic experts and laboratories.

In Europe, ENFSI is undertaking its own self-transformation within each working group. Despite being aware of this scientific problem since the very first conference of the European Academy of Forensic Sciences (1997—Switzerland), only a few of those working groups have reached a consensus on how to interpret evidence in court. As stated in Part 2, Clark (Sally) (15), “those experts are trying to solve problems outside their fields of expertise” (p. 12, para 2.19). This explains why the ENFSI Board strongly supports initiatives such as the online training courses on statistics applied to forensic fields, and research on the interpretation

of evidence or the successful FORSTAT Workshops (<http://www.ies.krakow.pl/conferences/forstat2010> [accessed January 17, 2011]) aimed at improving the statistical background of the European forensic experts.

On June 4, 2010, the current chairman of the ENFSI Board sent a letter to the head of the Criminal Law Division of the Directorate General of Human Rights & Legal Affairs of the Council of Europe. The letter endorsed the report titled “Scientific evidence in Europe—Admissibility, Appraisal and Equality of Arms,” written by Christophe Champod and Joëlle Vuille (24), both of the University of Lausanne (Switzerland). It underlined, on behalf of the ENFSI Board, the parallelism between the strategic objectives of ENFSI and the recommendations given in that document, specifically “the importance of the scientific interpretation of results.”

The forensic scientific community can think itself lucky with the appearance of the Standards for the Formulation of Evaluative Forensic Science Expert Opinion (25) in the aforementioned document as a starting point toward a solid logical framework in the evaluation of evidence in Europe. Its scope is defined as “Forensic Expert Opinion formulated in the Evaluative or Evidential mode across all scientific disciplines” (25, p. 161). Probabilistic inference in forensic science has achieved enough scientific maturity because of a number of well-considered proposals dealing with terminology, the logical framework applicable, and the role of the forensic expert in evidence evaluation. The aforementioned standards are just one such example. Also, Part 1 (15, p. 6, para 1.7) states that “scientific knowledge is continuously advanced as more empirical research is undertaken, so it is inevitable that some hypotheses will come to be modified,” and “special caution is also needed where expert opinion evidence is not just relied upon as additional material to support a prosecution but is fundamental to it” and it is thus worth being aware of the growing concern in the scientific and judicial communities about how scientific evidence is being tendered in courts.

It should be acknowledged that categorical statements have usually been welcomed by the legal system. In Spain, handwriting examinations have been used to achieve convictions in terrorism cases. For instance, in bomb-production training courses for terrorists, it is frequent for those attending to take their notes by hand. When law enforcement agencies arrested suspects and handwritten notebooks seized, categorical statements of authorship clearly helped to achieve convictions for belonging to a terrorist organization, resulting in a minimum imprisonment of 6 years and 1 day. The strength of the evidence assessed in terms of categorical statements by forensic experts has always had extraordinary importance for the efficacy of any law enforcement and justice system, making it difficult to fight against this misunderstanding. Self-evidently, fingerprint examinations and DNA analyses have played a similar role in terrorism and other criminal organization investigations. But while DNA procedure was tested in depth from a scientific point of view from its inception, fingerprinting has not been tested to a similar extent (13,26,27). Nevertheless, categorical statements on identity have been defended by fingerprint experts all around the world for decades. Undoubtedly, the so-called DNA paradigm marks a new era in the assessment of evidence in courts (13,28).

It is believed that it is not possible to avoid a strong comparison between the traditional criminalistic context and the likelihood paradigm (5) from the scientific community. Terminology and logical framework problems related to the evaluation of evidence by forensic scientists have been discussion points within laboratories as is clearly addressed in Chapter 6: Improving Methods, Practice, and Performance in Forensic Science, Section: Reporting Results (13, p. 6–3):

There is a critical need in most fields of forensic science to raise the standards for reporting and testifying about the results of investigations. For example, many terms are used by forensic experts in reports and in court testimony to describe findings, conclusions, and the degrees of association between evidentiary material (e.g., hairs, fingerprints, fibers) and particular people or objects. Such terms include but are not limited to match, consistent with, identical, similar in all respects tested, and cannot be excluded as the source of. The use of such terms can have a profound effect on how the trier of fact in a criminal or civil matter perceives and evaluates evidence. Yet the forensic science disciplines have not reached agreement or consensus on the precise meaning of any of these terms. Although some disciplines have developed vocabulary and scales to be used in reporting results, they have not become standard practice. This imprecision in vocabulary stems in part from the paucity of research in forensic science and the corresponding limitations in interpreting the results of forensic analyses.

This comparison explains to a certain extent a controversial recommendation recently given in the United States (13, p. S–17), the already famous Recommendation 4:

To improve the scientific bases of forensic science examinations and to maximize independence from or autonomy within the law enforcement community, Congress should authorize and appropriate incentive funds ... for the purpose of removing all public forensic laboratories and facilities from the administrative control of law enforcement agencies or prosecutors' offices.

Suggesting independence from or autonomy within law enforcement agencies. It is believed that appropriate changes should be taken in official labs regarding quality assurance procedures and the full integration of the likelihood paradigm in their daily reasoning and reporting work.

## The Role of Science in Criminalistics

### *What can Science Actually do?*

As Royall (5, p. xi) wrote in the Preface:

Science looks for statistics for help in interpreting data. Statistics is assumed to provide objective methods for representing scientific data as evidence and for measuring the strength of that evidence. Statistics serves science in other ways as well ... But its most important task is to provide objective quantitative alternatives to personal opinions for interpreting the evidence produced by experiments and observational studies. In this role statistics has made fundamental contributions to science.

Therefore, the most important task of science regarding reporting results is to provide objective methods for evaluating evidence after carrying out the relevant analyses according to accredited procedures.

Problems need to be acknowledged along the last century as regards interpreting data as evidence by statisticians. The Neyman–Pearson–Wald decision-making and the Fisherian (*p*-value) prevailing paradigms for the last century were erroneously applied as solutions to interpret data as evidence (5, p. xi).



... All is not well, however. Standard statistical methods regularly led to the misinterpretation of results of scientific studies ... These misinterpretations were not a consequence of scientists misusing statistics. They reflect instead a chronic defect in current theories of statistics. These problems exist because the discipline of statistics has neglected a key question for which it is responsible: when does a given set of observations support one hypothesis over another? In other words, when is it right to say that the observations are evidence in favor of one hypothesis vis-à-vis another?

Royall (5) argues that: “The concept of evidence is missing altogether in the Neyman-Pearson theory—its author insisted that rejecting one statistical hypothesis in favor of another signifies a decision to act in a certain way, and nothing else” (p. xiii). Though significance tests (*p*-value procedures and rejection trials) have attempted to do what Neyman-Pearson does not (to quantify the strength of statistical evidence), Royall (5) shows that significance tests fail in this endeavor because they rest on the faulty foundation of the law of improbability.

As the same author concludes (5): “The likelihood paradigm represents a solution to the dilemma that science has faced since the emergence of the modern Bayesian movement in statistics in the 1950s” (p. xiii). In other words, the logical defects and inconsistencies of frequentist statistical methods (of both the Neyman-Pearson and the Fisher school).

It has oftentimes been reiterated that categorical statements on identity are found in forensic reports all over the world as set out in Chapter 1: Introduction, Section: Pressures on the Forensic Science System, Paragraph: Questionable or Questioned Science (13, p. 1–7) the following:

Some forensic science methods have as their goal the “individualization” of specific types of evidence (typically shoe and tire impressions, dermal ridge prints, tool marks, and firearms and handwriting). Analysts using such methods believe that unique markings are acquired by a source item in random fashion and that such uniqueness is faithfully transmitted from the source item to the evidence item being examined (or in the case of handwriting that individuals acquire habits which result in unique handwriting). When the evidence and putative source items are compared, a conclusion of individualization implies that the evidence originated from that source, to the exclusion of all other possible sources. The determination of uniqueness requires measurements of object attributes, data collected on the population frequency of variation in these attributes, testing of attribute independence, and calculations of the probability that different objects share a common set of observable attributes. It is very important for the results of the investigation to be made public, so that they can be reviewed, checked by others, criticized, and then revised, and this has not been done for some of the forensic science disciplines.

Even though in the last two decades forensic statisticians and scientists have emphasized the importance of avoiding fallacies in reporting conclusions and in following the likelihood paradigm (7), and some international forensic institutions such as ENFSI have made efforts in both directions, nowadays there are still official laboratories in Europe, even members of ENFSI, using categorical frameworks to interpret data as evidence, mainly in so-called traditional criminalistic fields of expertise such as

fingerprints, firearms, and tool mark comparison or handwriting examination.

The individualization paradigm has been harshly criticized in (Champod C. Interpretation of evidence and reporting in the light of the 2009 NRC report. Keynote Speech of the Interpretation and Evaluation Session of the V Conference of the European Academy of Sciences held in Glasgow, University of Strathclyde; 8–11 September 2009), where the author emphasized that this paradigm should always be avoided in the forensic science community as it is not necessary in order to be useful, not even in DNA. It is a very crucial question to understand what philosophers of science, experts in logic and probability theory, and forensic statisticians, among other scientists, have published in recent decades about how to make an inference to evaluate the evidence, in the awareness that “individualization” implies an unjustified leap of faith (3). As Kaye (9) comments in footnote number 39: “Accepting any inference about any population parameter is never risk-free. ‘The gap between the sample and the population will always require a leap of faith.’ (29) The only issue worth debating is the length of the leap.”

Once clarified that the interpretation of data as evidence is the main task of forensic experts in trials, how should evidence be evaluated in practice? The so-called likelihood paradigm by Royall (5) solves the problem, and as an example, the above-mentioned Standards for the Formulation of Evaluative Forensic Science Expert Opinion (25) from the AFSP does what Royall recommends. In essence, “What it is necessary to distinguish is the difference between the following questions once observations have been made: what is to be believed?,” “What is to be done?,” and “What does that observation say about A versus B, when A and B are, generally speaking, simple hypotheses?” and “How should this observation be interpreted as evidence regarding A versus B?” (5).

### *Objectivity*

Experimental science claims to be objective knowledge. Objectivity has a double meaning: intersubjective validity on the one hand and something belonging to the real world on the other hand. The former suggests that scientific methods and results are valid for any person, whatever their personal convictions. Both meanings are related to each other.

Scientific intersubjectivity cannot be interpreted as perfect logical demonstration: scientific demonstrations cannot be formulated using only logical links. Epistemologists cite contextual demonstrations, emphasizing their dependency on the context of the objectivation adopted. The concept of objectivation is used here in the same sense as Evandro Agazzi does. For example, “... if we agree to investigate reality using a precision scale, a chronometer, or a rigid rule to verify propositions with predicates as ‘mass’, ‘time’ or ‘length’ according to standardized measurement procedures, then we can establish the immediate truthfulness or falseness of a number of base-statements and will formulate empirical assertions of classical mechanics” (10, p. 121; translation carried out by the authors). As Artigas (30) defines it, objectivation is a set of theoretical and practical procedures used to make scientific objects, and asserts that objectivation is the key to establish inter-subjectivity in science.

However, objectivity when understood as lack of personal influence in forensic findings is illusory (11,12). The belief in the ability of statistics to inject and guarantee objectivity takes root in the already mentioned paradigms predominant in the last century. In this sense, difficulties can be predicted for those who want to understand reporting results given by forensic experts in nonintuitive disciplines. “Intuitive” forensic science disciplines are defined

as those whose results are supported by descriptions or audiovisual means, which facilitate educated laymen's understanding of scientific reasons expounded by scientists in their reports.

Unlike traditional criminalistics, the newer disciplines address complex phenomena whose results cannot be easily interpreted by laymen. Even if results from intuitive disciplines were to be easily understood by everybody, the inference process in evidence evaluation from data, as has been mentioned earlier repeatedly, is not a trivial matter as it can be full of misunderstandings. Therefore, the apparent objective character of a forensic report does not imply that it could be easily understood by anyone in the same way, nor that it is actually objective. The problem of interpretation will be always present, even in the so-called factual reports (25).

Objectivity from an accreditation viewpoint has to do with validated methodologies, calibrated and verified equipment, detection and quantification thresholds, certified reference material, and uncertainty, accuracy, and precision estimation when measuring. It is also related to the assurance of repeatability and reproducibility of results; selectivity, specificity, and traceability of procedures; and to proficiency testing and to be subjected to internal and external audits by accredited experts and national organizations for test accreditation. Some scientists have summarized all those requirements in two words: transparency and testability (28). Unfortunately, this kind of objectivity proved to be compatible with mistaken ways of evaluating evidence (using verbal scales of probability of propositions claimed by parties or even categorical conclusions).

ISO 17.025 accreditation guarantees the technical competence of laboratories and the reliable results of tests and calibrations. The Spanish National Entity for Accreditation (henceforth, ENAC) is the Spanish entity responsible for establishing the accreditation system following international rules and EU policy in this matter.

There are no supplementary guidelines in the EU similar to those of the American Society of Crime Laboratory Directors/Laboratory Accreditation Board (ASCLD/LAB) in the United States. So far, there has been an initiative promoted by ENFSI based on the experience of more advanced European laboratories in this field so as to help others to accredit their official tests (known as the EMFA project—European Mentorship for Forensic Accreditation Project), and EU countries will have to comply with the provisions of the European Commission Directive on DNA and fingerprint analyses accreditations.

Several months ago, ENAC promoted ad hoc working groups before auditing, for the first time, new specific criminalistic tests, carried out almost exclusively or preferably by official forensic laboratories (fingerprinting and handwriting examinations in particular). The meetings were attended by practitioners of the aforementioned laboratories—carefully chosen by their directors—and members of ENAC. The practitioners showed ENFSI and Interpol's documents (31), and some forensic bibliography on which to base their tests, but difficulties arose when they asked ENAC members to accredit their conclusions: ENAC does not allow the interpretation of results to be accredited.

In the evaluation of evidence, it is very important to distinguish suitably between results (data), the interpretation of results (interpretation of data as evidence), and the conclusions (what experts answer to questions made by petitioners of forensic reports). In fingerprint and handwriting comparisons, inductive inference should be made once data is obtained, and hence the conclusions are clearly interpretations (evaluation of evidence). The so-called evaluative opinions (25) are not logically compatible with categorical or probabilistic statements about propositions. However, there are already quite a few examples in Europe regarding accreditations

under ISO 17.025 with accredited conclusions made using, for instance, categorical or probabilistic statements about propositions, like in the fields of handwriting or fingerprint comparisons. Such was the case in Spain in two main laboratories belonging to ENFSI.

In this context, it is believed that results may be accredited, as well as the interpretation of results within a solid logical framework such as the likelihood paradigm (not at all in the individualization paradigm), and the conclusions as well, because they may be composed for any or both of them, that is, results and interpretation of results.

“Does it make sense to plan for accreditation deadlines in respect of classification pattern problems which have not yet been established on solid logical bases and in the context of the evaluation of evidence?” Such a policy could result in the general discrediting of the accreditation system used in forensic science. It is believed that this could be the case with respect to fingerprint comparisons in Europe owing to the current policy of the European Commission on this matter (32).

#### *Scientific Reliability in the Spanish Judicial System*

There are two different systems in Spain in the evaluation of admitted evidence. The first one is called the “Free Evaluation System” and the second is known as the “Legal Evaluation System.” If the rationale of the latter is to consider that this system implies a higher legal certainty, the former system is said to provide greater rationality.

In the “Legal Evaluation System,” the statutory law indicates to the judge the value of evidence without taking into consideration the judge's opinion. For example, in Spanish civil procedure the evaluation of public documents is carried out according to this system (Art. 319 of the Civil Procedure Law), and therefore, if a public document is not challenged, the judge must take it into account as true even if he were to have any doubt about it.

On the other hand, in the “Free Evaluation System,” the judge evaluates evidence freely. This system applies in Spanish criminal procedure to all types of evidence. This view notwithstanding, it is also true that in practice, judges, who obviously are not scientists, consider that documents coming from official laboratories, if not challenged, have a privileged strength from an evidence standpoint. Therefore, in trial, it is very important for the expert witness to interpret or explain the expert's report data ably, so as to enable the judge to make a proper evaluation thereof.

Taking into account the four options in evaluating evidentiary reliability in the common law as quoted in Part 4, Introduction, 4.3 (15): (i) Exclusionary discretion without guidance; (ii) Exclusionary discretion with guidance; (iii) An admissibility rule requiring consensus among experts in the field; and (iv) An admissibility rule requiring the trial judge to assess the evidentiary reliability of the tendered evidence, and focusing exclusively on the issue at hand about scientific reliability, the principle of free evaluation of evidence in the Spanish judicial system would fit into the first option. Therefore, both the pros and cons about the scientific reliability of expert evidence can be found in case laws, but the above-mentioned legal reform in 2002 of the LECrim provided a new way for considering some forensic reports (determination of nature, amount, and purity of drugs) as scientifically reliable. In this case, scientific reliability has been legally established, and there have already been case law extending this scientific reliability condition to other types of forensic reports.

As Spanish legislature is responsible for establishing which forensic reports should be deemed scientifically reliable, such a

qualification derives solely from the official laboratories (these are the main providers of forensic services within a legal system based on the continental law), actual sources of arguments used by courts in case law. Therefore, the key to considering which forensic reports are reliable and which others are not is precisely the opinion held by said official laboratories. This was exactly what happened at the Supreme Court in Spain as regards fingerprint examinations, but in that case through their case law.

## The Legal and Scientific Status of Forensic Evidence in Spain

### *Spanish Model for Incriminating Evidence*

According to Guerrero Zaplana J., a Spanish Judge, in (Valoración de la prueba pericial en el juicio oral. Presentation in the II Symposium on Forensic Speaker Recognition organized by the Universidad Politécnica de Cartagena (Spain); 1999 November), Art. 741 of the LECrim establishes an incriminating evidence model according to which only the actions taken in accordance with the principles of orality (right of the accused to be heard, oral testimony of the witnesses, oral deliberations etc.), contradiction (cross-examination), immediacy (presence of the parties and their witnesses at the trial) and publicity (public trial) can be referred to as such. According to constitutional case law, the only means of proof ([http://ec.europa.eu/civiljustice/evidence/evidence\\_spa\\_en.htm](http://ec.europa.eu/civiljustice/evidence/evidence_spa_en.htm), to understand the concept “means of proof” used in the Spanish Law [accessed January 17, 2011]) that can be used to invalidate the presumption of innocence are those used in trial, in addition to evidence existing before trial, that is, impossible or difficult to produce at the trial.

However, this idea should not be understood radically which leads to the denial of the value as evidence of police and legal inquiry proceedings even if conducted in accordance with Spanish constitutional and procedural laws; but rather, it is required—for the recognition of this efficacy of evidence existing before trial—that they should be reproduced at trial under conditions that give the defense lawyer the opportunity to contest them or to tacitly accept their content (SSC case law, e.g., see sentence dated April 27, 1998).

Exceptions to this rule are the assumptions of advance evidence, and evidence existing before trial as long as defense and contradiction rights are granted. However, when reports are drawn up by the officially appointed experts, in collegiate form, and enjoying the permanence and job tenure of the civil servant, usually distanced from the case in point, with high levels of specialization and assigned to bodies endowed with the costly resources which modern analysis techniques require, it does not seem out of place to regard them as objective, impartial, and independent, which in principle gives them value as evidence without procedural contradiction. However, their reports can be contested either by asking in writing for extensions or explanations, so that they can be accepted at the trial as documentary evidence or by demanding the experts’ presence during the proceedings.

This evidence is regarded as the evidence existing before trial because of the nature of the procedural system, as it is not possible for the experts working for the above-mentioned official institutions, departments or laboratories cannot carry out their tasks if they have to always be present at the trial to ratify their reports.

It is not disregarded that the prosecutors have to provide the evidence, and this has to be carried out in court in contradictory fashion and no procedural responsibility in this regard. However, in view of the guarantees offered by said expert reports, they are considered as evidence—in theory—without prejudice to the right of

the accused to challenge its impartiality (by way of the possibility of refusal, which is always open) and to submit them to questioning if it is so entitled, thereby being guaranteed the right to defense (SSC case law, e.g., see sentences dated November 11, 1993, May 21, 1997, and June 24, 1998).

To understand how evidence is considered in the LECrim a brief explanation of how the Spanish criminal proceeding is made up is in order. There are two distinct, different stages: the first one is called investigative stage and the second one, trial stage. The former is mainly addressed to finding out circumstances around a crime and its authorship. During this phase, investigative actions are undertaken (e.g., scene examination or questioning), but these activities do not actually constitute legal evidence and therefore they cannot invalidate the presumption of innocence, nor be enough to convict. On the other hand, they can be used for the investigating magistrate to decide to shelve the record of proceedings or start the second stage (“the trial”). This phase, today and except in the case of penal proceedings involving minors, falls within the responsibility of an investigating judge though nowadays there are proposals asking for this responsibility to be assigned to the prosecutor in Spain. At the second stage, under a different Judge, the prosecutor makes charges and the evidence is provided—according to the four above-mentioned principles (i.e., orality, immediacy, contradiction, and publicity) and, as a general rule, the judge shall proffer a sentence convicting or acquitting based on the evidence given before the court.

Chapter III of Title III (called “the staging of the trial”) of the LECrim establishes which evidence may be used in criminal proceedings and how it has to be given before the court in order to be taken into account when passing sentence. Said chapter distinguishes between the deposition by the accused (Art. 688 and ff.), witnesses (Art. 701 and ff.), expert evidence (Art. 723 and ff.), and documentary evidence (Art. 726). As a general rule for the judge to consider the first three means of evidence, this requires the presence of people before the court, for example, an eyewitness who may state what he saw or heard or a forensic expert explaining in court the conclusions of the report issued by his laboratory. However, when the evidence is documentary, there is no declaration in court but rather magistrates can read the document for themselves.

As regards the distinction between expert evidence and documentary evidence in Spanish law, the former is required when scientific or artistic knowledge is needed to assess some fact which the judge does not have and must thus ask an expert to convey this to him. For example, in an analysis about narcotic substances, the judge—who is not a scientist—does not know whether the seized drugs is cocaine, heroin, or just flour, and he thus requires the aid of an expert who tells him, “What substance it is” and “What its weight and purity are.” This report, carried out by an expert, is expert evidence. On the other hand, documentary evidence is (usually) a document but in which there is no scientific analysis. For example, a letter sent by someone to someone else telling him that on a trip to a certain country he acquired a certain amount of hashish or, to use another example, a bank statement.

It should be borne in mind that expert reports are not a means of proof like others: it does not adduce facts to the process like witness and documentary evidence and depositions, as established by the LECrim; however, it is used by the judge as an auxiliary means to duly interpret certain facts that are already part of the process, provided through other means of proof. Moreover, it is a necessary element, because the judge does not have the technical knowledge necessary to solve the problem.

The fact that an expert is needed does not mean that his report is binding on the judge: first, it would be impossible to solve a



case when reports are contradictory (a clear paradox of categorical statement reporting is that contradictory categorical statements are possible to be found in court, which should be impossible if the disciplines were, as claimed, scientific). According to case law, if there are several expert reports on the same issue, it is the impartial organ, that is, the court presiding over the evidence, that decides which will prevail. Elements from different reports could also be used (SSC case law, e.g., see sentence dated March 7, 1987). "Should there be only one expert report?" it would not be binding on the judge, because they are not by themselves incontrovertible truth (SSC case law, e.g., see sentence dated July 8, 1987).

The value as evidence of expert reports relies neither in the statements nor in the authors' position and standing but in their scientific basis and grounds. The statements or conclusions of a greater rational quality will prevail, without ignoring other auxiliary criteria as coincident majority or their not being related to the interests of the parties (SSC case law, e.g., see sentence dated May 11, 1987).

In any trial, witness, documentary, and expert evidence are usually examined; the results might be mutually contradictory, both within and between types. Expert reports as well as other means of proof are subjected to the principle of free appraisal of the proof which basically requires a joint assessment, without giving more value a priori to one of them. Thus, if apart from the expert report, different evidence has been examined in relation to a specific issue and with different results, the court has the authority to make a joint appraisal of the evidence to ascertain that the truth of the facts to be clarified is not the truth set out in the expert report, but the truth offered by the other means of proof (SSC case law, e.g., see sentence dated October 28, 1998). Therefore, the expert does not adduce facts to the process, but opinions, neither does he/she aver on the existence or nonexistence of facts.

Expert reports, that is, opinions about certain facts, can be finally accepted or not by the court. According to case law, the judge dissents, upon reasoning, from the conclusions set in the expert reports, particularly when the report does not express a certainty, but merely a possibility, and an alternative possibility rather than an exclusion (SSC case law, e.g., see sentence dated April 29, 1997). The court can only diverge from the conclusions drawn by the expert when there are objective reasons that allow or justify it. The reasons that have led the court to diverge from the expert reports should be clearly specified, so as to avoid the risk or the suspicion of arbitrariness.

To sum up, expert evidence is not binding on the judges. An expert report is a practical or scientific advice that affords a better insight of the reality underlying a problem, submitted to the consideration of the judges; in accordance with case law, a judge may not yield or relinquish his/her evaluating responsibility (SSC case law, e.g., see sentence dated October 28, 1997).

#### *A Critical Review of the Spanish Legal Reform to Evaluate the Nature, Weight, and Purity of Drugs in Criminal Proceedings*

In 2002, on the occasion of the endorsement of the Organic Law 9/2002 of December 10, 2002, which changed the Spanish Penal and Civil Codes on child abduction, the LECrim was amended by adding a second paragraph to Art. 788. According to this principle "the expert report can be presented by a single expert. Within this procedure, a report issued by an official laboratory in relation to the nature, amount, and purity of drugs will be considered as documentary evidence as long as the fulfillment of the scientific protocols approved by the relevant standards has been specified." In other words, in the scope of the Spanish brief procedure certain

expert reports are subjected to a legal consideration appropriate for documents, that is, it transforms expert evidence into documentary evidence.

The legislature justifies this reform on the basis that expert reports prepared by official institutions regarding the weight, amount, and quality of drugs are not, strictly speaking, scientific testing. Their repetition and execution according to specific scientific procedures (official protocols), they say, makes it necessary to consider them as documents of an objective reality and, it has to be added, it is said, as the impartiality and job tenure of the relevant officers in charge (SSC case law, e.g., see sentence dated February 3, 2009) as well. However, although this is not the only point, because of this reform some experts will not have to attend trial, which in turn will prevent the judge from deciding between interrupting the proceedings, in case of nonappearance, or rendering the evidence insufficient to nullify the presumption of innocence (14,33).

It is commonly accepted practice by some jurists to distinguish between two different expert reports: those that they called "scientifically objective" and those based on opinions (34). By means of testing (e.g., DNA tests), a "scientifically objective" report purports to verify the accuracy of a statement or to establish the certainty of some facts. An opinion report, on the other hand, does not intend to verify but rather, to assess or evaluate a fact or circumstances of a fact (e.g., a psychological report). Then, the legislature has decided that the analysis of drugs, which in its own opinion falls within the scope of "scientifically objective" reports, should not be kept as such in the Spanish brief proceeding and rather, should be dealt with as documentary evidence. Since the above-mentioned amendment, the same legislature considers the above-quoted drug reports as documentary evidence in brief criminal proceedings while expert evidence in ordinary criminal proceedings: a clear inconsistency in the Spanish legislation!

Nevertheless, the legislature does not take into consideration that:

- According to the Art. 456 LECrim, the judge agrees with the production of an expert report whenever scientific or artistic knowledge is needed to learn of, or understand any fact or relevant circumstance. Conversely, a document intended for criminal proceedings is something different: it is an item (*corpus*) which shows or displays something (*docuit*) but additionally, it is "strange" to the process as the document should not be produced on the basis of the process (*estraneità*). In the case in point, scientific expertise is needed to determine the nature, amount, and purity of the substances. That is the reason why the judge requires an expert (a person who is an outsider to the process and has the appropriate specific training) to produce an expert report (scientific testing). There is a clear reference here to expert evidence, not just documentary evidence.
- Even if "scientifically objective" reports are presented, careful consideration is strongly advised for their interpretation (not only with regard to the conclusion on nature, amount, and purity of the substances but also on whether the official protocols have been fulfilled). The expert should transmit this interpretation to the judge, who is a lay person in this field (cf.: see Madrid Provincial Court case law num. 26/2004 of 29 April: the public prosecution proposes as documentary evidence the reading of page 104 where the techniques used to carry out the analysis are explained: "Color R., organic solvents extraction, CCT, EIA, GC-SM, HPLC. Besides this statement, it also includes an explanation of the terms expressing the richness of each product analyzed"). It is obvious that based only on this, a judge who is a lay person in this field will not be able to infer that the analyses

were carried out in compliance with the scientific protocols approved by the relevant standards.

- When testing is carried out, there is also or there may be a variability regarding the conclusions. Suffice it to observe the test organized by ENFSI on the detection of the nature and purity of several drugs, which is discussed in the Appendix. It is believed that analyses on drugs are expert reports (forensic evidence), as are other types of scientific evidence (e.g., fingerprints, DNA, handwriting, etc.), and they may not be considered as simple documents (documentary evidence). On the other hand, as the likelihood paradigm is still not used in most official departments in official laboratories, there exists a wide variability in terms of conclusions. This variability could cause problems in the interpretation of conclusions. It is believed that such interpretation should be made by the expert and not by the judge himself by simply reading the report. In spite of this, the legislature has unrealistically deemed expert evidence to be documentary evidence. This is a relevant question as it is not only a change of designation, but it implies a change in the approach to the reports submitted during the process. In that respect, the following opinion is held:
  - Since this reform was enacted, it is neither necessary to have the expert appointed by the judge nor to have the officers appear before the judge in order to accept their appointment. Likewise, the principles whereby experts may be rejected are debatable as well (see Art. 467 and ff., 662, 663 and 723 LECrim).
  - At the evidence proposal stage, to specify the name and surname of the expert who is going to make a statement on the case is no longer needed (Art. 656 LECrim). However, it is believed that it is necessary that the party concerned should propose the relevant evidence, so that the judge may take into account in his/her judgment the test results. Ex officio evidence is not allowed when Art. 726 LECrim (related to documentary evidence) establishes that “the Court itself will examine the books, documents, papers and other pieces of conviction...” This principle is contained in Art. 728 LECrim (at a party request), and it makes possible ex officio evidence with the exceptions quoted in Art. 729 LECrim (14).
  - The manner of giving evidence in courts is modified as well: in the case of documentary evidence, the expert does not attend the trial to ratify his/her report or to answer/clarify any question related to such report. As noted above, this is a relevant point because it may not be easy to interpret the conclusions of the analysis. Moreover, it is possible that the report is not even read during the hearing (cf.: Art. 726 “the Court itself will examine...”).
  - Additionally, the rejection of the analysis will not necessarily imply the presence of the experts during the hearing. In those cases where any party challenges the report SSC case law (see, e.g., SSC sentences dated September 27, 2006, July 2, 2008, and February 3, 2009) proffers several solutions depending on all possible circumstances. Thus,
    - The experts will not appear during the trial if the party rejects the report without solid grounds. The analysis, however, will be assessed as evidence for the prosecution.
    - When the party rejects the report and proposes the expert’s appearance without proper justification, the court will not accept it and once more the analysis could be assessed as evidence for the prosecution (Noncase law agreement ruled by the SSC on May 25, 2005).
    - If the expert’s appearance is requested based on solid grounds, the court will accept it if appropriate. Then, the Tribunal will assess the expert’s statements.

- Finally, it is possible that a party may reject the report and submit a contradictory report. Both reports should be assessed by the court according to the rules of “sane criticism.” If, as a general rule, the evidence submitted which is sufficient to plead successfully the presumption of innocence is one undertaken according to the principles of orality, contradiction, immediacy, and publicity, it seems obvious that converting the expert evidence into documentary evidence will imply the contravention of the publicity and immediacy principles, along with strong limitations on the contradiction principle as well.
- Fifth, translating expert evidence into documentary evidence will have an impact on the appeals against judicial decisions. Thus, as regards the appeals to the Supreme Court (appeals for cassation), it needs to be considered that analyses on drugs are “documents” according to the second paragraph of Art. 849 LECrim. As regards appeals, it would also be important whether the analyses are considered documents or expert evidence (evidence of a personal nature). Note that judgments of acquittal and some aggravating convictions too will be almost impossible to observe when the mistake affects the assessment of evidence of a personal nature (35), for example, in the Spanish Constitutional Court (henceforth, SCC) case law (see, e.g., sentence number 167/2002 on September 18, 2002 and another more recent sentence numbered 120/2009 on May 18, 2009).

In conclusion, by virtue of practical or operational factors, the legislature pursues a fiction: to change the nature of certain expert reports and turn them into documents, in spite of prejudice to judicial guarantees.

This reform is disagreed with for the aforementioned reasons. Additionally, the aim pursued, that is, to avoid experts attending the trials being able to thwart a negative effect on their work, could have been reached by other means while preserving the expert nature of evidence. In this regard, expert substitution is widely accepted, meaning that if the expert who carried out the analysis is not available, he/she can be replaced by another expert. Videoconferencing (65% of the appearances in court of the civil guard forensic experts to give evidence were carried out by videoconferencing in 2009) is another possible technique to allow the expert to make a statement without moving to the court facilities.

#### *A Recent Drug Analysis Proficiency Test by ENFSI*

It has been observed that the same type of reasoning has been expanded to other criminalistic areas by Spanish Courts (see the next paragraph), and it is possible that by case law or new law amendments, most or all expert evidence areas, when reports have their origin in official laboratories, could be reclassified as documentary evidence. Drug analysis was selected as a pioneering technique because of its “objectivity,” but even in this area controversy has arisen as a recent proficiency test from ENFSI on the nature and purity estimation of drugs has recently shown (details in the Appendix).

Experimental data variability is not only explained by the proper nature of what is being observed, but by the applied observation methodology among other variability sources. When the weight of drug samples is measured, the weight measurement uncertainty depends on errors because of calibration processes of the precision scale, to biases of the precision scale, and its own weight procedure. The ISO standard titled “Guide to the Expression of Uncertainty in Measurement—1993” is recommended by the international scientific community to calculate the weight of drug samples by means of precision scales.



Consequently, any forensic expert wishing to weigh drug samples from seizures should also include uncertainties associated with their measurements. However, some drug official forensic reports have lacked uncertainty calculations, resulting in quite a lot of disparity in the results achieved among different European official laboratories, with some substances remaining undetected by some of them (for more information on the variability expected in the determination of the nature and purity of drugs from European official laboratories and from some other contributors involved in the ENFSI Drugs Working Group in a proficiency test held in late 2008 (ENFSI Drugs Working Group. Wiesbaden: proficiency test organized by Dr. Wolf-Rainer Bork (Bundeskriminalamt), 2008–2009), see the Appendix).

This example, anyway, was artificially scheduled by the organizers. Drug forensic cases have huge variability. Active ingredient quantification is the first stage for any analysis to be a success because, for example, a seized drug is often mixed with other substances or could be concealed; environmental or case conditions could bias the analysis results; uncertainty measurements from weight and purity analytical processes have to be correctly combined and interpreted; sampling criteria has to be clearly determined and justified and so on. Consequently, the claimed objectivity in such analyses is not synonymous with easiness but rather is full of intellectual obstacles. It seems to make no sense to deal with any drug case applying the same criteria, as those criteria should be explained or defended in court.

On the other hand, this example is shown to illustrate probable interpretation problems with the so-called factual opinions (25). A drug forensic report should include information about homogeneities of large drug seizures, the type of range that could be expected and whether the results obtained are much more probable if one alternative hypothesis is true (for instance, the probability of observing these quantitative results if the purity is above a certain level) over another one, following the likelihood paradigm. Therefore, it is not primarily the analytical result which it is important, but what it may mean in the context of the case.

### Implications for Other Forensic Examinations and Possible Future Consequences

Since 2002, some case laws have been made by different Spanish Courts applying the analogy of drug examinations, that is, the consideration as documentary evidence of psychological, psychiatric, and veterinarian forensic reports, fingerprint examinations, and forensic reports made by medical examiners (14). Based on simple arguments which served to classify these other types of forensic examinations as “objectives,” and guaranteeing the independence of official forensic experts, because they belong to public institutions, scientific discussion on how to evaluate data as evidence was set aside. Practical reasons to expedite proceedings (a benefit for the laboratories as well because forensic experts do not need to travel to court as often to make statements) justify the support given to this change of judicial treatment of forensic reports by jurists, directors, or senior officials of public laboratories and even by forensic experts.

This policy may lead to a future application of this principle to any kind of expert report. Therefore, new legal reforms in that direction could be proposed. So, although the US scientific community tries “to promote the development of forensic science into a mature field of multidisciplinary research and practice, founded on the systematic collection and analysis of relevant data,” as Recommendation 1 of the National Research Council report (13) states, one of the fields in need of a greater improvement in daily forensic practice all over the world, that is, evaluation of evidence from a solid

logical framework, is simply ignored. On the contrary, conclusions of official forensic reports are shielded and problems of interpretation of evidence are subordinated to the ability of lawyers.

### Contrasting the United States Supreme Court Case of *Melendez-Diaz v. Massachusetts* with Spanish Law

In June 2009, the United States Supreme Court, in a case involving a certificate of analysis indicating the presence of an illegal drug, established as unconstitutional under the Sixth Amendment to the Constitution the admission in evidence of a certificate of analysis without the expert's testimony [*Melendez-Diaz v. Massachusetts*, 129 S.Ct. 2527 (2009)]. The question raised was whether a conviction may be sustained based upon an expert's certificate of analysis without the ability of the defendant to confront (cross-examine) the expert. The certificate of analysis was considered “testimony” by the Supreme Court, and therefore the defendant was entitled to question the expert about the report. If the defendant had the opportunity to question the expert under oath prior to trial, such as during a deposition, the presence of the expert at trial may not be required, and the certificate of analysis, along with a transcript of the deposition, could be admissible. In either event, the ability to question the expert witness would help ensure that the expert's opinion on the nature of the drug would be neutral and objective.

The Spanish situation is completely different. It is not possible to come to the same conclusion. Art. 24 of the Spanish Constitution establishes some guarantees called constitutional rights including, as is pertinent to the case under study, actual legal guardianship, to be judged in due process of law, to use applicable means of proof for self-defense, and prohibition of defenselessness. However, the SCC, which is the interpreter of the Spanish Constitution, has warned that:

- The right to use means of proof is a right bestowed on the Spanish legislature to establish the regulating standards for its exercising (SSC case law, see, e.g., sentence number 136/2007, June 13, 2007). As a consequence, the legislature regulates the different evidence and may establish a series of limits and, in this regard, it may establish that reports on drug analyses may be regarded as documentary evidence.
- This right is not absolute and unconditional (SCC case law, see, e.g., sentence number 11/1981, April 8, 1981). According to Art. 24 of the Spanish Constitution, only judges and courts can “examine the lawfulness and relevance of proof” (SCC case law, see, e.g., sentence number 60/2007, March 16, 2007). Therefore, though a party may request the presence of a scientific expert before the court to give evidence, in case of being considered unnecessary by that court, that presence will not take place and this fact will not be unconstitutional.
- Not all types of irregularities in a criminal process may be regarded as a constitutional contravention, but only those which cause actual defenselessness (SCC case law, see, e.g., sentence number 15/2005, January 31, 2005).
- Drug analyses have frequently been carried out before trial and constitute evidence existing before trial. If it is being formally submitted at the investigative stage of the criminal proceeding on an undisputed basis, the judge himself may examine them (SCC case law, see, e.g., sentence number 15/2005, May 9, 2005).

As regards that said in the SCC case law, it is believed that the SCC—which should decide what is unconstitutional—considers that Art. 788.2 of LECrim regarding the nature, amount, and purity of drugs conforms to the Constitution, and the failure to declare of experts in court cannot be regarded as breaching the constitution even if this expert report is the only evidence for the prosecution.

However, that article refers to particular types of analyses (the drugs analyses carried out by official laboratories regarding the nature, amount, and purity of said drugs) and limited to a specific process (the so-called brief criminal proceeding), not spreading its scope beyond *strictu sensu*.

### *A Paradigm Shift?*

*The Origin of the Problem in Spain (and Most European Countries)*—The paragraph titled “Challenges Facing the Forensic Science Community” (13, p. S-3) reads as follows:

For decades, the forensic science disciplines have produced valuable evidence that has contributed to the successful prosecution and conviction of criminals as well as to the exoneration of innocent people... Those advances, however, also have revealed that, in some cases, substantive information and testimony based on faulty forensic science analyses may have contributed to wrongful convictions of innocent people. This fact has demonstrated the potential danger of giving undue weight to evidence and testimony derived from imperfect testing and analysis. Moreover, imprecise or exaggerated expert testimony has sometimes contributed to the admission of erroneous or misleading evidence.

In spite of the advances of forensic science for decades, admission of erroneous or misleading evidence has taken place with possible wrongful convictions of innocent people. The instruction by the Congress of the United States to the National Research Council to undertake the study (13) (at the request of a Consortium of U.S. Forensic Science Organizations) because it required significant improvements. Behind this need for significant improvements was also the previous controversies expressed by the academic world and the public opinion in the United States for years (14).

Therefore, one of the problems entailing that Europe is not equivalent to the United States as regards the justification of the need for a report like that of the National Research Council report (13) comes from the absence of such a previous controversy in most European countries. It is worth mentioning, the initiative carried out in England and Wales by the House of Common's Science and Technology Committee during 2004 and 2005, publishing the Seventh Report titled *Forensic Science on Trial*. This reports states that the Association of Chief Police Officers had agreed on the need for a protocol regarding the validation of scientific techniques prior to their being admitted in court. The absence of controversy partially explains the very different reactions in the European laboratories since the release of this report and the very different speeds to insert the new paradigm in daily forensic practice. The ENFSI Board scheduled a comprehensive program of activities to announce it during 2009, specifically at the 21st annual meeting held in Ankara (Turkey) in May 2009 and at the seminar held on August 24, 2009 and August 25, 2009 at the Bundeskriminalamt in Wiesbaden (Germany). Nonetheless, the U.S. report should be comprehensively studied within each European laboratory and in conjunction with each national judiciary. Perhaps results could be expected thereafter affecting the judicial scene.

To avoid the serious risk of minimizing the strength of the current sensitivity about the necessity of improving the evaluation of evidence in court, the academic and scientific communities should be involved in each country to guarantee a sound and effective discussion. The risk is highest in countries where almost all forensic

reports are made by official institutions in criminal proceedings. It is for this reason that the academic and scientific involvement and/or the internationalization of the debate are absolutely necessary.

### *How to Change the Paradigm*

On one hand, the controversy among statisticians along the last century has been quoted and its impact on science. On the other hand, mention has also been made of the relevance of many common ways of reporting conclusions and their consequences in courts and even in statutory laws. “How can mentalities now be changed, tried, and tested under old paradigms, mainly inside law enforcement agencies or prosecutor's offices long used to considering some scientific proof as infallible?” And “How can it be explained to the courts that until now some evidence was deemed safe, but from now on, the same evidence will be deemed uncertain?” In fact, one does not need to be a prophet to predict the kinds of reactions to be expected. The current situation in many laboratories is that it is not difficult to find generalized inconsistencies in the ways of reporting conclusions between different fields of expertise in the same laboratory, or within the same criminalistic field.

Recently, the SKL announced in the aforementioned Vth Conference of the European Academy of Forensic Science its decision to unify the manner of drawing conclusions, regardless of the fields of expertise involved, in order to provide the same kind of information to courts. It is believed that this should be the first step that every laboratory should undertake in order to change mindsets. And as previously performed by this laboratory, the entire staff of forensic experts should be absolutely convinced of the need to do just that. The Swedish laboratory needed years to achieve this objective.

Other institutions have made important efforts to ensure that judges and prosecutors understand the new paradigm, to interpret evidence in trial (during recent years, a number of European universities and laboratories have started seminars, courses, conferences, and the like for judges and prosecutors on the evaluation of scientific evidence). However, there is no official information as to how the laboratories related with the corresponding law enforcement agencies have viewed this paradigm shift.

In the meantime, the opinion on how forensic laboratories should act as legal reforms on evaluation of evidence in criminal proceedings are being studied by jurists consists of reporting the need for a paradigm shift, which has been steadfastly supported by the scientific community for the last two decades. The National Research Council report (13) was a solid and strong call for a change in the traditional way of thinking in evidentiary data evaluation within the whole forensic community.

### *Possible Alternative Solutions for the LECrim Reform*

The Spanish legal reform objectives have to be compatible with the demands of science. The statutory law, which was amended by adding a second paragraph to Art. 788, was preceded neither by any previous scientific debate nor any reference to the international state of the art. Spain runs the risk of distancing its evidence legislation from Europe if scientists do not take part in law commissions before reforming their criminal proceedings and if the debate is not immersed in the global forensic paradigm shift.

Following examples of other countries (13,15,25), nations should be able to find good ways of adapting evidence regulation to current scientific state-of-the-art.

In the meantime, provisional solutions could be implemented such as incorporating technology and procedures, which speed up proceedings. Of course, those measures alone are entirely insufficient. Legal reforms will be necessary, which preserve both judicial and scientific requirements.

## Conclusions

In this paper, it has been endeavored to show why any legal reform dealing with scientific evidence in court needs to preserve the legal and constitutional guarantees while aligning itself with state-of-the-art scientific knowledge. The very nature of forensic evidence reliability has been challenged in the last two decades, and a new paradigm is spreading steadfastly across countries toward a more solid and well-grounded forensic science. However, the 2002 LECrim reform veered toward the opposite direction; objectivity and reliability were attributed to expert evidence provided by official laboratories by way of the legal status of documentary evidence instead of that of classical expert evidence and to official reports dealing with weight, purity, and nature estimations on seized drugs, a status which could be expanded by case law or other legal reforms to other criminalistic areas. It is believed that the objectives of reform regarding the efficiency and simplicity of laboratory procedures for reporting and testifying in court can and must be met satisfying simultaneously both legal guarantees and international scientific standards.

Furthermore, any supplementary guidelines to the ISO 17.025 standard on accrediting identity criminalistic tests or any policy to improve this type of forensic service should be based on a solid logical framework, appropriate to the efficient and scientific evaluation of evidence, as is the case in a DNA comparison. If not, those measures could bring discredit on the accreditation system in forensic science because transposed conditional fallacies could not only be committed but accredited!

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## Appendix

### *ENFSI Proficiency Test on Drug Analysis*

In this test, there were four different sources for drug samples: A: Heroin mixture; B: Cannabis (Hashish); C1 and C2: 3-CPP tablets with traces of amphetamine; and D: amphetamine mixture. The organizer asked participants for the nature and purity of drugs.



TABLE A.1—Descriptive statistics for the variables.

Purity	Sample A	Sample B	Sample C1	Sample C2	Sample D
No. of labs	56	48	30	15	55
Mean	32.5	5.33	14.85	0.93	13.99
Median	33.4	4.95	14.85	0.4	14.2
SD	3.98	1.64	2.16	1.56	1.77
Highest	39.8	12	21.8	6.3	18.2
Lowest	9.6	2.6	11.6	0.1	7.9
RSD	12.2%	30.7%	14.5%	167.8%	12.7%

SD, standard deviation; RSD, relative percentage between standard deviation and mean.

TABLE A.2—Descriptive statistics for the variables once outliers removed.

Purity	Sample A	Sample B	Sample C1	Sample C2	Sample D
No. of labs	51	44	28	13	52
Mean	33.06	5.03	14.42	0.44	14.12
Median	33.4	4.88	14.70	0.4	14.25
SD	1.93	0.81	1.43	0.22	1.34
Highest	37.03	7	16.73	0.8	16.99
Lowest	27.93	3.7	11.6	0.05	10.9
RSD	5.8%	16.1%	9.9%	50%	9.4%

SD, standard deviation; RSD, relative percentage between standard deviation and mean.

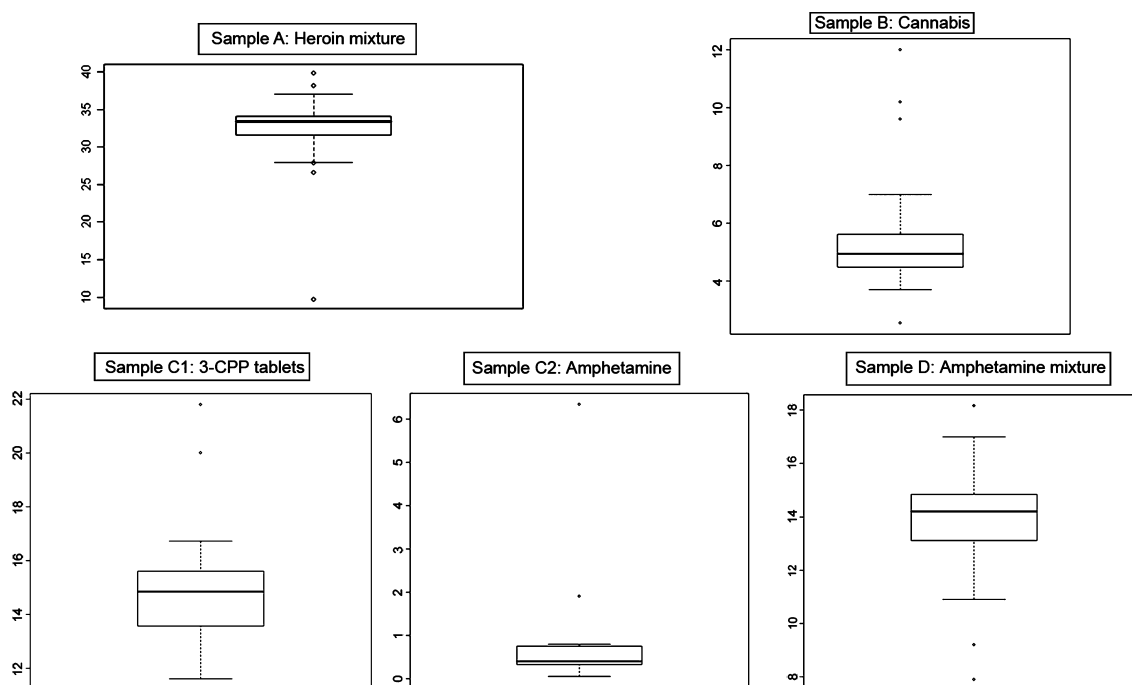


FIG. A.1—Box plots showing median (thicker black line) and outliers.

Sample C had two different drugs, each of them in very different proportional quantity.

Homogeneous pieces of samples first by a “Grindomix” mill and second by mortar and pistol were distributed to all participants.

ENFSI had 54 members (almost all of them are European governmental laboratories) when the collaborative test was carried out. The organizer numbered up to 71 possible participants in the test (it is usually allowed to some nonmember of ENFSI laboratories to take part in such as activities).

The main techniques used by participants were high-performance liquid chromatography with diode-array detection to

quantify active ingredients, and gas chromatography–mass spectrometry, in the main, to detect the nature of them.

The organizer summarized results providing the following data per sample: mean, standard deviation (SD), relative percentage between standard deviation and mean (RSD), median, highest, and lowest value when numeric values were given by participants (purity); and quality information (“+”: hit; “–”: fail; “(+)”: hit with some objections) when were not given those numeric data (nature). Table A.1 summarizes purity results from the four tests (some errors in SD and RSD of Sample C1, and RSD of Sample C2 were detected by the authors of this paper and were corrected, see Table A.2). Box plots are shown in Figure A.1.