

Scientific Expertise and Judicial Decision Making: Comparative Insights

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The interplay between law and science is increasingly illustrated by many debates, ranging from biological filiations to global warming. It is barely necessary to emphasize the extent to which this very interplay stands at the core of the legal answer to genetics. This paper focuses on some aspects of the relationship science and law foster.

The relationship between science and law has been studied through two main analytical frameworks.

(1) According to the main approach, law and science are to be thought of as forming two separate spheres, each of them ruled according to its own principles and producing specific outcomes. Generally speaking, science is supposed to provide a true account of the world, whereas legal rules are deemed to regulate human behaviour. Hence, legal systems would incorporate many goals other than merely truth seeking, such as solving social disputes in a convenient amount of time. This conception emphasizes the ‘culture clash’² that characterizes the relationship between science and law.

Accordingly, the relationship between science and law may be conceived in a twofold perspective. One of them is to advocate the continuous adaptation of law to science. What we recognize here is a notion very familiar to jurists, according to whom law will comply with its own requirements only if it remains in a close adequacy with the object it is supposed to regulate. Here also lie the roots of the idea of progress and its relationship with the legal system. Science is seen as an ongoing progressive process. Therefore, if the legal system remains closely connected to it, it will increase the rationality of its own operations.

Conversely, the interplay between science and law might be conceived in a much less harmonious way. The autonomous development of science has often been regarded as threatening society. It has been advocated that science would force its own development on

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² GOLDBERG S., *Culture Clash : Law and Science in America*, New York, New York University Press, 1994 ; FOSTER K. R. and HUBER P. W., *Judging Science. Scientific Knowledge and the Federal Court*, Cambridge, MIT Press, 1999 ; FAIGMAN D. L., *Legal Alchemy. The Use and Misuse of Science in Law*, New York, W. H. Freeman and Co, 2000.

society, thus preventing people from developing their own project in life. Hence, the legal system is here expected to provide an efficient protection against a hegemonic scientific development. The progress-laden conception is here strongly criticized: the democratically debated legal provisions would reflect a social consensus on how far we want to follow scientific progress. There will be, some say, 'a right to assess scientific progress'.³

(2) I hold that none of these approaches is likely to give an accurate account of the interplay between science and law. Indeed, they both take the divide between law and science for granted. It is my contention that this very border is forged in the interplay itself. When the judge or the legislator is required to pronounce on a scientific issue, he decides, in a more or less explicit way, the criteria scientific knowledge must fulfil to be granted scientific standing in a legal setting. In that sense, 'the institutional setting of the law shapes the representation of legally relevant scientific claims at many points, beginning with the articulation of standards for what counts as valid science with the legal process. In other words, ideas of truth and ideas of justice are co-constructed in the context of legal proceedings'.⁴

As a result, the interplay between law and science is poorly described as a mere adjustment of law to science. Rather, a legal conception of science emerges from it.

This interplay occurs on many occasions. I will focus my attention on the trial, and more precisely on the scientific testimony experts provide to courts. Expertise might be defined as the process in which scientific knowledge is provided to someone in order to help decision making. Hence, expertise is at the core of any decision where scientific knowledge is to be taken into account.

It derives from this definition that the framework in which the decision-making process is taking place, and particularly the proceedings it follows, will be of decisive influence on expertise. Scientific expertise in court must then be understood in its relationship to the judicial decision-making process.

It is now that the question arises of how the judge would ensure that the scientific knowledge carried by an expert is not corrupted by ignorance or raw fraud. The term that has been coined to designate this insufficient knowledge is 'junk science'. As the law attributes the label of 'junk science', it might be said that the legal system is providing a criterion of science within the limits of legal framework.

³ HERMITTE M.-A., « Un droit à l'inventaire des progrès techniques », *Annales des Mines*, « Responsabilité et environnement », n° 7, 1997, pp. 67-70.

In that sense, the selection of scientific experts enables the legal system to face the epistemological ‘problem of demarcation’ raised by Sir Karl Popper.⁵ Popper aims at discriminating between what counts as science and what does not. He would then allow science to be immune from any social or metaphysical roots and would concentrate only on the structure of scientific utterances.

This legal conformation of science is not universal, as reveals a comparison with the legal system of the United States. Both the French and the American systems are facing the problem of demarcation in forging a legal construction of science. A properly legal epistemology is to be seen in legal rules on expertise. Indeed, determining which expert is allowed to testify in court leads to determining what will count as science in the eyes of the legal system. Selecting scientific experts induces a choice on what might be ranked ‘good science’ and what must be termed ‘junk science’. Thus, a plurality of legal constructions of ‘good science’ has to be described.

In French law, the scientific validity of an expert’s testimony is certified before the trial (I), whilst in the United States legal system judges act as gatekeepers for valid science (II).

I- A ‘scientific legality’: a legal construction of science before a trial

French law’s provisions on scientific expertise involve a legal construction of science. In this case, the selection of scientific experts is largely done before any trial takes place. Within the French legal system, the judge is entitled to commit an expert: the expert does not belong to the court but he is appointed by the court. The legal provision through which this selection of experts prior to a trial is done leads to the certification of what counts as ‘good science’. The legal mechanisms contributing to this legal representation of valid science might be termed ‘scientific legality’. This scientific legality enables the French legal system to address the problem of demarcation between ‘good science’ and ‘junk science’.

1- The official lists of court-appointed experts

The selection of scientific experts is mainly done through a list of experts. When they require appointing a scientific expert, the judges suffice with choosing one of them from this

⁴ JASANOFF S., *Science at the Bar. Law, Science and Technology in America*, Cambridge, Harvard University Press, 1995, preface, p. xiv.

⁵ POPPER K., *La logique de la découverte scientifique*, Paris, Payot, 1973, pp. 30 sqq.

list. The appointment of these experts is not compulsory for the judges, who might very well choose an expert outside the lists. Nevertheless, these lists prove to be very effective. Although one could hardly claim to have an exhaustive view of the practice of the courts, statistics show that judges usually pick experts from these lists.⁶ Furthermore, in criminal cases the judge can avoid picking the expert from the list only on exceptional grounds and with a special motivation.⁷ In civil cases, although the practice might be very different in each court, judges usually appoint experts from the lists.

As a result, the legal provisions on the constitution of the lists contribute to the selection of scientifically relevant experts. Thus, in order to be registered on the list, the scientific experts must show a certified knowledge.

a- Expert's registration on a court-appointed experts list

Legal provisions determine the qualities an expert must possess in order to appear on a court-appointed experts list. Historically, the expert's skill was mainly revealed by the diplomas he was required to hold, but the courts were entitled to select them along with their own preferences and criteria.

More recently, however, various commissions have been created in order to verify the expert's competence and, at the same time, proceed to their registration on the list. For example, experts in charge of the identification of people through DNA typing must have been approved by a special commission.⁸ The candidates must prove to have completed a specific diploma or to have a long-lasting experience of that practice. Furthermore, those who apply for registration must demonstrate that they dispose of certain specific materials and property. Equally, a recent statute on the rights of sick persons and on the quality of health care has created a specific list of experts who must be approved by a national commission on medical accidents.⁹ This Commission is charged to ascertain the scientific knowledge of the experts and then to register them on the list, without allowing any appeal.

Not only does the certification of the experts' knowledge take place before their registration on the list, but, in some specific cases, their competence is also ascertained on a periodical basis. Regarding the experts on the identification of people through DNA typing, a

⁶ LE TOQUEUX J.-L., *Les expertises judiciaires civiles et administratives*, Études & statistiques justice - 2, 1992, Sous-direction de la Statistique, des Études et de la Documentation, Ministère de la justice, 1993, p. 11.

⁷ Article 157 du Code de procédure pénale.

⁸ Loi n° 71-498 du 29 juin 1971 (article 6-1), insérée par la loi n° 94-653 du 29 juillet 1994 (articles 16-11 et 16-12 C. Civ.) ; décret n° 97-109 du 6 février 1997, modifié par le décret n° 2002-931 du 11 juin 2002, *JO*, 14 juin 2002, art. 5.

governmental agency¹⁰ is charged, among others, to organize application exercises which the registered experts must pass twice a year. The results determine whether or not the experts will remain registered in the following year.¹¹

Thus, these lists lead to a standardization of the knowledge experts must possess. The registration will then endow their holders with a specific legitimacy. The standardization effect is reinforced by the classification of scientific fields it induces.

b- The nomenclature of scientific fields

The lists are divided into many specialities ranging from medicine, genetic typing, and handwriting identification to fires and explosions. This classification leads to a certification of valid scientific knowledge. It fulfils a performative function. The fields mentioned on the lists are deemed sufficiently reliable to be presented to a judge.

The nomenclature of scientific and technical fields used to be left to each court of appeal and to the Supreme Court (*Cour de cassation*) for civil and criminal matters. This led to a certain diversity among the courts, although some statutes created specific expert categories to be filled in each court.¹² In order to keep this diversity within certain limits, a unified nomenclature was issued in July 2002 by the Ministry of Justice in line with the expressed wishes of professional organizations.¹³ This new nomenclature is currently diffusing throughout the courts and is due to be taken into account shortly.

2- The professionalization of experts

Most of the registered experts are members of professional organizations. These organizations contribute, on the one hand, to the organization of the profession (discipline, deontology, etc.), and, on the other hand, to the standardization of the scientific knowledge of

⁹ Loi n° 2002-303 du 4 mars 2002 relative aux droits des malades et à la qualité du système de santé : art. L. 1142-10 et ss du Code de la santé publique.

¹⁰ Agence française de sécurité sanitaire des produits de santé : Article L. 761-24 du Code de la santé publique.

¹¹ A statute enacted 11 February 2004 makes compulsory for every expert registered on a list to pass a probationary period of two years before being registered for a five-year period. After two years, the skills and experience of an expert is ascertained by a joint commission composed of judges and experts (loi n° 71-498 du 29 juin 1971, modified art. 2).

¹² i. e. : experts spécialisés en matière de sécurité sociale (article R. 141-1 Code de la sécurité sociale) ; experts en diagnostic d'entreprise (article L. 813-1 du Code de commerce) ; experts en biologie chargés de la recherche et du dosage de l'alcool dans le sang (article R. 32 du Code des débits de boissons et des mesures contre l'alcoolisme)...

¹³ Nonetheless, the legal provisions voted in February 2004 are far from fully filling the professional organizations' expectations. The professional organizations had been pressing strongly on the Government to be granted a monopoly on scientific expertise in the courts. Conversely, professional organizations would have to control more accurately the knowledge of their members. This monopoly was not granted and the law states that judges may freely choose experts from the lists. See *Experts*, n° 60, 2003, p. 4.

the members. Many of these organizations enact quality guidelines including standardized methods and minimal knowledge to implement. As a result, the certification of scientific knowledge follows, not only from the procedures used for the establishment of the lists, but also from the professional standards.

Hence, as long as a scientific expert is registered on a list and shows the competence required by the legal provisions, he is presumed to be dependable enough to have a say in the trial. Consequently, during the trial, the competence of the expert is hardly discussed, for he is already deemed scientifically competent. Therefore, the expert might only be challenged for the same reasons that the judge would be: he might be challenged for being biased or for entertaining a special relationship with one of the parties. A recent sentence of the *Cour de cassation*, issued pursuant to Article 6-1 of the European Convention on Human Rights, holds that the list of recusation causes¹⁴ is not limitative and that an expert might be challenged if his behaviour had deprived the parties of due process of law.¹⁵ This sentence does not substantially change the legal picture, for the recusation of an expert remains closely related to the judgement and not to scientific competence.

The scientific legality in the French system hardly leads to a debate on what should count as valid science or what should not. The American system faces the demarcation problem differently.

II- A 'jurisdictional epistemology': the judges as gatekeepers against 'junk science'

In the US legal system, parties may recruit as many experts as they can afford. According to the *Federal Rules of Civil Procedure* (rule 26 (b), 4, A) : 'A party may depose any person who has been identified as an expert whose opinions may be presented at trial'. The number of designated experts might be of strong influence in the trial, all the more so if they prove to be famous in their field. This 'commodification of the expert'¹⁶ might increase dramatically the price of expert witnessing.

The experts are supposed to be neutral toward the case at trial but it is fairly obvious that they would be chosen according to the opinion they will raise in the case at stake. This is termed an *advocacy* system. Each expert-witnessing is discussed not only by the parties on

¹⁴ Article 341 du Code de procédure civile.

¹⁵ C. Cass., Civ. 2^e, 5 décembre 2002, *SA Pasteur Vaccins c. G.*, *Procédures*, 2003, n° 37, obs. R. Perrot ; *JCP*, 2003, IV, 1166.

¹⁶ JASANOFF S., *Science at the Bar. Law, Science and Technology in America*, Cambridge, Harvard University Press, 1995, p. 45.

trial but, more generally, also by every interested person or group. Those who wish to participate in the debate might issue an *amicus brief* exposing the scientific elements they deem appropriate to solve the case at hand. Furthermore, the judge may hear as many *amici curiae* as he would find necessary. For example, when the Supreme Court settled a case on euthanasia, the judges heard no less than eighty interested persons and groups. The judge is then providing an explicit balance between the various interests and theories at stake.¹⁷

1- The judge's gatekeeper function

Unlike in the French legal system, the scientific expert in the US legal system is not selected prior to the trial and his knowledge is not certified beforehand. Consequently, the judge will have to evaluate how reliable the expertise can be. To put it bluntly, the judge may face a situation in which he has to decide whom to trust more: a parapsychologist or a particle physicist.¹⁸

As a result, the debate on what is considered as reliable scientific knowledge is made visible and is subjected to cross-examination. The American system is then internalizing the process from which the scientific legitimacy of an expert derives. The control of the access of scientific knowledge to the courts is completed by the judge. The judge then has to fulfil a gatekeeper function. Whereas the French system displays a 'scientific legality', the American system rests upon a 'jurisdictional epistemology'.

2- The jurisdictional criteria for good science

As the judge is in charge of rejecting 'junk science', the courts had to design a criterion to identify what should count as 'good science'. The criterion in use has long been the *commercial marketplace test*. It was assumed that as long as an expert could make a living within his profession, he could be reasonably held more competent than the average juror. Nonetheless, this criterion led to unsatisfactory results, for it provided no guarantee of quality, especially in medical cases: a charlatan could very well make a living off the credulity of people. Hence, the question was debated of how the reliability of a proffered scientific expertise could be ascertained.

¹⁷ In a case involving engineering, see: EDMOND G., "Legal Engineering : Contested Representations of Law, Science (and Non-Science) and Society", *Social Studies of Science*, vol. 32, n° 3, 2002, pp. 371–412.

¹⁸ COLLINS H. M., *Changing Order*, London, Sage, 1985, rééd. 1992, spéc. pp. 113–128.

This question was raised in the *Frye v. United States* case heard by the United States Court of Appeals for the District of Columbia in 1923.¹⁹ Mr Frye was convicted of murder. He claimed to prove his innocence by using a lie detector test, a technique usually labelled a 'polygraph test'. The Court had to decide whether this proof was reliable enough to be presented to the jury. The Court rejected this expertise on the grounds of a 'general acceptance test': according to the Court, 'the thing from which the deduction is made must be sufficiently established to have gained general acceptance in the particular field in which it belongs'. Hence, the criterion rests on the acceptance of the technique or the theory in the scientific community. The judge must then measure how broadly it is accepted.

The general acceptance test has been largely diffused through the courts but some courts adopted a more deferential attitude toward science: any person claiming to be an expert might be heard in trial, except if the probative value of this expertise 'is substantially outweighed by the danger of unfair prejudice, confusion of the issues, or misleading the jury'. The *Federal Rules of Evidence*, which came into force in 1975, adopts this provision in Rule 403. However, it remained unclear whether the general acceptance test would have survived the enactment of the *Federal Rules of Evidence*. The doors of the courts remained largely open: any person claiming to be 'an expert by knowledge, skill, experience, training or education' may testify to the court (Rule 702). The spectre of 'junk science' had begun to haunt the courts.

3- The spectre of 'junk science'

Many criticisms were proffered against the liberality of the *Federal Rules of Evidence*.²⁰ The demise of the general acceptance test confronted the jury with scientific expertise whose quality was far from reliable, even fraudulent.

In *Daubert v. Merrell Dow Pharmaceuticals*,²¹ the United States Supreme Court was given an occasion to rule on the admissibility of expertise in court. Bendectin was a drug

¹⁹ *Frye v. United States*, 293 F. 1013 (1923).

²⁰ HUBER P., *Galileo's Revenge : Junk Science in the Courtroom*, New York, Basic Books, 1991 ; FOSTER K. and HUBER P., *Judging Science. Scientific Knowledge and the Federal Court*, Cambridge, MIT Press, 1999, pp. 69 *sqq.* ; MARCIA ANGELL M. D. (ed.), *Science on Trial. The Clash of Medical Evidence and the Law in the Breast Implant Case*, New York, Norton, 1997 ; For a critical appraisal : EDMOND G. and MERCER D., « Trashing Junk Science », *Stanford Technology Law Review*, n° 3, 1998.

commonly used by pregnant women against morning sickness. Following the birth of a child suffering limb defects, the parents sued the firm producing Bendectin, *Merrell Dow Pharmaceuticals*. The plaintiffs claimed to prove the existence of a causal link between the ingestion of Bendectin and their child's suffering. One of their expert witnesses showed a 'meta-analysis' of already existing epidemiological studies. These studies, however, showed no causal link between Bendectin ingestion and birth defects. Nonetheless, the expert claimed to be able to establish a link with a broader method of analysis.

The Supreme Court first invested the judges with the function of determining what should be held as good science: 'under the Rules the trial judge must ensure that any and all scientific testimony or evidence admitted is not only relevant, but reliable'. According to the Supreme Court, 'this entails a preliminary assessment of whether the reasoning or methodology underlying the testimony is scientifically valid and of whether that reasoning or methodology properly can be applied to the facts in issue. We are confident that federal judges possess the capacity to undertake this review'.

Then, the Supreme Court sets four criteria meant to help the judges in their newly attributed monitoring task:

1. 'Ordinarily, a key question to be answered in determining whether a theory or technique is scientific knowledge that will assist the trier of fact will be whether it can be (and has been) tested'.
2. 'Another pertinent consideration is whether the theory or technique has been subjected to peer review and publication'.
3. 'Additionally, in the case of a particular scientific technique, the court ordinarily should consider the known or potential rate of error'.
4. 'Finally, "general acceptance" can yet have a bearing on the inquiry. A "reliability assessment does not require, although it does permit, explicit identification of a relevant scientific community and an express determination of a particular degree of acceptance within that community." ... Widespread acceptance can be an important factor in ruling

²¹ *Daubert v. Merrell Dow Pharmaceuticals*, 509 U. S. 579 (1993). See SANDERS J., *Bendectin on Trial : A Study of Mass Tort Litigation*, Ann Arbor, The University of Michigan Press, 1998 ; SANDERS J., « The Bendectin Litigation : A Case Study in the Life Cycle of Mass Torts », 43 *Hastings Law Journal* 301 (1992) ; LASAGNA L. and SHULMAN S., « Bendectin and the Language of Causation », in Foster K., Bernstein D., Huber P., *Phantom Risk. Scientific Inference and the Law*, MIT Press, 1993, pp. 101–122; ENCINAS DE MUNAGORRI R., « La recevabilité d'une expertise scientifique aux États-Unis », *Revue internationale de droit comparé*, n° 3, 1999, pp. 621–632.

particular evidence admissible, and “a known technique that has been able to attract only minimal support within the community”.

The *Daubert* criteria reveal the epistemic syncretism of the Supreme Court. On the one hand, it refers to a now standard epistemology: quoting Popper²² and Hempel,²³ it refers to falsification (tests) and to potential rates of errors of scientific theories. On the other hand, the Court mentions social aspects of scientific community: peer review, general acceptance. In this sense, the Supreme Court tries to conciliate classical epistemology with more recent developments in social studies of science: ‘The late Karl Popper’s largely discredited notion of science as progressing through clear falsification of erroneous claims appeared side-by-side with the view of constructivist sociologists of science that knowledge accumulates through negotiation and consensus among members of scientific community’.²⁴

The *Daubert* case has been applied ever since and it has even been extended. In *General Electric Company v. Robert K. Joiner*,²⁵ the Supreme Court urges the judges not only to screen the conclusions of the expert but also to screen the reasoning he has been using. In *Kumho Tire Company v. Patrick Carmichael*,²⁶ concerning an engineer in tyres, the Supreme Court holds that the *Daubert* rule must also be applied to non-scientific expertise.

Conclusion

Whereas the French legal system addresses the problem of demarcation through statutes and through the activity of various committees, the US legal system places it at the heart of the trial. As a result, a federal judge well may have decided that the technique of fingerprint identification, though broadly in use in forensic science, does not meet the *Daubert* requirements of scientificity.²⁷ In that decision, after a strict scrutiny of the fingerprint technique, the judge held that ‘fingerprint identification techniques have not been

²² POPPER K., *Conjectures and Refutations: The Growth of Scientific Knowledge*, 5th ed. 1989, p. 37 : ‘[T]he criterion of the scientific status of a theory is its falsifiability, or refutability, or testability’.

²³ HEMPEL C., *Philosophy of Natural Science*, 1966, p.49 : ‘[T]he statements constituting a scientific explanation must be capable of empirical test’.

²⁴ JASANOFF S, “Beyond Epistemology: Relativism and Engagement in the Politics of Science”, *Social Studies of Science*, vol. 26, 1996, pp. 393–418, spéc. p. 406 *sqq.*

²⁵ *General Electric Company, et al. v. Robert K. Joiner*, 522 U. S. 136, 146–47 (1997).

²⁶ *Kumho Tire Company v. Patrick Carmichael et al.*, 526 U. S. 137 (1999): ‘This case requires us to decide how *Daubert* applies to the testimony of engineers and other experts who are not scientists. We conclude that *Daubert*’s general holding—setting forth the trial judge’s general “gatekeeping” obligation—applies not only to testimony based on “scientific” knowledge, but also to testimony based on “technical” and “other specialized” knowledge’.

²⁷ *United States of America v. Carlos Ivan Llera Plaza, Wilfredo Martinez Acosta, and Victor Rodriguez*, 179 F. Sup. 2d 492, 2002 U. S. Dist.

tested in a manner that could be properly characterized as scientific'. He adds that the technique hasn't properly been submitted to publication and peer review, for those who use this technique hardly form a 'scientific community' in the *Daubert* sense. Furthermore, no rate of error is even known for this technique.

In this sense, the scientificity of a proffered scientific expertise is made visible and is subjected to the hard look of the judges. But the question was raised of how far judges can be able to fulfil the gatekeeper function they are endowed with. In the United States, some plead for the development of special scientific training for judges. A reference manual is periodically issued in order to review the latest scientific consensus in each field.²⁸

In the most recent years, more attention has been paid to the faculty offered to the judge to appoint a scientific expert. In order to ease the judge's task, the American Association for the Advancement of Science is leading a five-year research program in order to assess how a list of certified experts could be helpful for judges.²⁹ Concerning particularly debated subjects, it could be possible to appoint a scientific panel of experts representing diverse opinions regarding the scientific aspects of the case at stake.³⁰

These suggestions reveal, to a certain extent, a parallel between French law and American law. Both systems aim at facing the demarcation problem. It cannot come as a surprise that they sometimes converge to some extent. This shows that describing the interplay between science and law as an adjustment of law to science would overlook the variety of legal constructions of science produced by legal systems.

²⁸ *Reference Manual on Scientific Evidence*, 2^d ed., Federal Judicial Center, 2000. Also see : CONLEY J. and PETERSON D., « The Science of Gatekeeping : The Federal Judicial Center's New *Reference Manual on Scientific Evidence* », 74 *N. C. L. Rev.* 1183 (1996) ; WALKER L. and MONAHAN J., « *Daubert* and the *Reference Manual* : An Essay on the Future of Science in Law », 82 *Va. L. Rev.* 837 (1996) ; KREILING K., « Review-essays : *Reference Manual on Scientific Evidence* (Federal Judicial Center ed., 1994) », 36 *Jurimetrics J.* 121-147 (1996).

²⁹ A five years *Court-Appointed Scientific Experts Project* has been initiated by the American Association for the Advancement of Science in 1999.

³⁰ This technique has been used for the silicon breast-implant case: MARCIA ANGELL M. D. (ed.), *Science on Trial. The Clash of Medical Evidence and the Law in the Breast Implant Case*, New York, Norton, 1997; HOOPER L. L., CECIL J. S., WILLGING T. S., « Neutral Science Panel : Two Examples of Panels of Court-Appointed Experts in the Breast Implants Product Liability Litigation », *Federal Judicial Center*, 2001; GOSS P., WORTHINGTON D., STALLARD M. *et al.*, « Clearing Away the Junk : Court-Appointed Experts, Scientifically Marginal Evidence, and the Silicone Gel Breast Implant Litigation », 56 *Food Drug L. J.* 227 (2001); WALKER L. and MONAHAN J., « Scientific Authority : The Breast Implant Litigation and Beyond », 86 *Va. L. Rev.* 801 (2000).