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JUDGING BEYOND ANY REASONABLE DOUBT: A LOGIC AND EPISTEMOLOGICAL RULE

Rocco Neri*
rocco.neri@giustizia.it

ABSTRACT: The doubt is not related to innocence but only to guilt, the latter being the exclusive object of the process. The proof of guilt, being always of inductive nature, cannot accept the deductive method that connotes the relationship between premise (minor and major) and conclusion. From here arises the necessity that beyond reasonable doubt must respond to the postulates of logic and the motivation of judgments is an example. Research tends to show whether there is a valid theory to overcome the doubt of uncertainty about guilt-innocence. Can jurisprudence (mathematics-legal) as an exact science aid in the discovery of a perfect syllogism for a valid theory of reasonable doubt?

KEYWORDS: beyond any reasonable doubt, jurimetrics, criminal procedure, evidence, logic, science.

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* Master's degree in Law University of Teramo; Judicial law clerk in Rimini Courthouse.

1. BARD'S RULE: BRIEF HISTORICAL INTRODUCTION

The BARD criterion (an acronym for beyond any reasonable doubt) is the description of a fact that must obtain total evidential confirmation as true if and only if there isn't a reasonable alternative description of the same fact[1].

The existence of a reasonable doubt is a sufficient factor to «falsify» the description of the fact, even in the presence of a total evidentiary confirmation of its truth[2]. In fact, when the evidence provides confirmation of the hypothesis of guilt, the existence of a «reasonable doubt» prevents conviction. Section 1096 of the California Penal Code (1872) provides a more comprehensive definition that has now been adopted by most civil law and common law jurisdictions. It is far worse to convict an innocent person than to let a guilty person go free[3].

In fact, the foundation on which the principle rests is found in the «in re Winship'» ruling (1970). In favor of the preference for the option of a guilty unpunished there are also reasons inherent in the costs in terms of social disutility.

Not only, therefore, the safeguarding of the rights of the individual, but also the need to do as little damage as possible to the moral force of criminal justice (Kahneman *et al.*, 1997, p. 388). In this sense, letting a guilty person go free certainly represents a disutility, but nothing to do with the disutility that would be determined in the case of conviction of an innocent person, with the attendant risk of undermining the trust placed by citizens in the proper functioning of the penal system.

The Winship ruling therefore elevated the criterion of beyond reasonable doubt to a constitutional principle. According to this decision, it is the Due Process Clause, contained in the Fifth Amendment, which requires the demonstration of the guilt of the defendant beyond any reasonable doubt; and such proof must cover not only the typical fact, but every constituent element of the crime (Allen, 1980, pp. 321-368).

In the Massacre Trials of 1770[4] for defending the perpetrators of the Massacre, Adams took refuge in the well-known doctrine of the *via tutior,* reminding the jurors

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[1] See Picinali (2018, p. 81).

[2] See Kageghiro and Stanton (1985, p. 55); Simon and Mahan (1971, p. 73).

[3] See Shapiro (1991). These are the words of Justice Brennan in the milestone 1970 U.S. Supreme Court decision In re Winship (1970). It is quite widely accepted that the degree of proof of guilt that would satisfy the BARD. 's criterion is quantifiable in percentage terms. The most common quantification is in the sense that this evidence should exist to a degree greater than 95%.

[4] On the night of March 5, 1770, Captain Thomas Preston, of Her Britannic Majesty's 29th Infantry Regiment, placed himself at the head of a column of seven grenadiers to save some comrades whom a crowd of Bostonians had surrounded in front of the King Street customs house: as often (and still daily) happens when professional soldiers are confronted with crowds of civilians more or less unarmed, passion overpowered reason and the city, in an episode that will be handed down to posterity as the Boston Massacre, found itself crying five dead and six wounded. The Governor of Boston immediately imprisoned Preston and the grenadiers who participated in the Massacre but only in late autumn the souls of the population were considered sufficiently quiet to start the process: for the defense, extremely

that it is always preferable to make a mistake when acquitting than when convicting. «If you doubt that the prisoners are guilty, do not declare them so!» These are the words of Paine, who, although in the role of public prosecutor, exhorted the jury as follows: «If therefore in the examination of this Cause the Evidence is not sufficient to Convince you beyond reasonable Doubt of the Guilt of all or any of the Prisoners you will acquit them». The arguments of the two lawyers must have struck a chord in the conscience of the jurors if (apart from the contradictory nature of some of the testimonies for the prosecution) all the defendants were acquitted (except for two of the grenadiers who were branded on the thumb and then released). Adams and Paine were doing nothing more in their conclusions than evoking arguments that had been circulating in the Christian conscience for more than a millennium[5]. With the advent of the adversarial system, we realize the need to rebalance the positions of prosecution and defense, since the defendant is disadvantaged by the so-called combat effect, generated by the competitive approach of the parties. These are the basic characteristics of the process of the twentieth century. In fact, the future chief justice of the Supreme Court of the United States, Edward D. White, defined the principle of guilt «beyond reasonable doubt» in the case *Coffin v. U.S.* (1895) as «the condition of mind produced by the proof resulting from the evidence in the cause» (Langbein, 2003, p. 62).

1.1. Bard's rule between jurisprudence and codification.

In American doctrine the concept of reasonable doubt has been based on moral certainty, and the lack in the US legal system of the reason for the verdict or judgment prevents an epistemological development of the concept of reasonableness and doubt. In fact, in systems of verdict without grounds, as in common law, the rule of reasonable doubt applies, while in civil law systems with obligation to state reasons there was not originally such a rule of judgment. The first step for the codification of reasonable doubt, at least in Italy, is in the Statute of the International Criminal Court (ICC, 1998), signed in Rome on 17 July 1998 and ratified by Italy by law 12 July 1999, n. 232, where art. 66 states that in order to convict the accused the Court must be convinced of repetition beyond reasonable doubt. In addition, the rule lays down the clear and express duty to state reasons for judgments.

In the Italian system, therefore, the standard of proof of reasonable doubt has long remained without express provision within the Code of Criminal Procedure (from now on, C.P.P. 1988). In Italy, due also to the Franzese judgment of 2002

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convinced that it was the right of every Englishman to receive the best possible defense, offered his services the future President of the United States John Adams (1735-1826); the Crown, instead, chose Robert Treat Paine (1731-1814), another patriot and future signer of the Declaration of Independence, to represent its charges in court.

[5] *«Tutior semper est errare, in acquietando, quam in puniendo», «quod dubitas ne feceris»*, in Decretum Gratiani (1300-1315).

(Cass. Pen. SS. UU., 11 settembre 2002, n. 30328), the codification of reasonable doubt comes with Law n. 46/2006, which amended art. 533 paragraph 1 and has established that the judge pronounces sentence when the accused turns out guilty of the crime which it is accused of beyond any reasonable doubt. This provision today constitutes the express normative translation of the constitutional principle of the presumption of innocence (art. 27, co. 2, Costituzione 1947).

The Franzese and Cozzini jurisprudence (Cass. Pen., SS.UU. 11 settembre 2002, n. 30328; Cass. Pen., Sez. IV, 17 settembre 2010, n. 43786) states that the application of the standard of proof of reasonable doubt is no longer left to the prudence of the court but constitutes a legal imperative that is bound to the theme of proof of causality. In this sense Franzese judgment, on the subject of causality, it affirmed that the reconstructive hypothesis formulated in the course of the investigation must undergo an attempt to refute it in the course of the trial by the impact of the adversarial procedure through which the defense can dismantle the accusation and where appropriate, consider alternative reconstruction. Such a rule of evidence is in perfect harmony with the rule of judgment beyond reasonable doubt in the light of the concept of logical probability. For its part, that judgment accepted the American canon in the wake of the Daubert trilogy according to which the recurrence must be proven beyond any reasonable doubt in the criminal trial. Therefore, the evidence of accusation is insufficient when the prosecutor does not prove the reiteration of the accused by eliminating in the judge any reasonable doubt; while they must be considered contradictory when, despite being superior to the evidence of innocence, are part of a probative framework which, as a whole, does not appear to be consistent and unambiguous.

In fact, a judgment cannot be based on an objectively controversial scientific law; if it turns out that both the scientific laws (and the explanations) proposed by the prosecution and the defense respectively are plausible, the threshold of reasonable doubt cannot be considered to have been exceeded, without the judge being able to opt, even on a reasoned basis, for one of the proposed solutions. In the Cozzini judgment (Cass. Pen., Sez. IV, 17 settembre 2010, n. 43786) the judge would be obliged to conform only to the scientific laws assisted by «common acceptance in the scientific community», without being able therefore to base his own conviction (and in particular a sentence of condemnation) laws still lacking general acceptance, even when this conviction is supported by the expert[6]. In Cozzini judgment the lack of «common acceptance in the scientific community» and the existence of contrasts in the scientific community itself, necessarily roots a «reasonable doubt» on the cogency of the explanation of the public prosecutor and imposes an absolute outcome pursuant to art. 533 C.P.P. 1988. On the other hand, the expert's opinion is a voice that, although qualified, expresses a personal point of view, scientifically accredited but personal[7]. All this implies a return to the principles expressed in the Frye judg-

[6] See Cass. pen., sez. IV, 17 settembre 2010, n. 43786.
[7] See Blaiotta (2010, pp. 364 ss.).

ment of the US Supreme Court (*Frye v. United States*, D.C. Cir. 1923), with respect to the position in the Daubert judgment: the decision must be taken on the basis of the standard of balance of probabilities, not that of beyond any reasonable doubt, characteristic of criminal judgment[8].

2. THE CASE OF SCIENTIFIC PROOF BEYOND ANY REASONABLE DOUBT: THE DAUBERT TRILOGY

In recent American judicial history, there have been three decisions (Daubert trilogy) of evidence acquired with the help of subject matter experts: the three decisions of the U.S. Supreme Court, between 1993 and 1999, on the use of expert evidence in the US federal system. Despite being civil cases their principles are applied in criminal proceedings.

The first case-law: Daubert v. Merrell Dow Pharmaceuticals, Inc. (1993)

In Daubert[9], the Supreme Court, unlike the Federal Court and the Federal Court of Appeal, affirmed that the standard for the admission of scientific evidence was set by the Federal Rules Evidence (FRE, enacted in 1975) (United States, 1975). A standard as rigid as Frye (*Frye v. United States*, D.C. Cir. 1923) said the Court would be in contrast to the «liberal push» of the Law and their general approach of easing traditional barriers to the admission of (expert) evidence. Again, according to the Court, Rule 702 places limits on the admission of experts by assigning the trial judge the task of ensuring that expert testimony is reliable. The Court has enucleated some «factors» to distinguish genuine science from junk, asking judges to make this assessment when they admit evidence including:

— whether a theory or technique can be (and has been) tested;

— has undergone a peer review and publication process;

— if, in relation to a particular technique, there is a known or potential error rate (*e. g.* voice spectrographic identification technique), also considering the existence and maintenance of standards that control the operation of the technique;

— whether theory or technique is generally accepted in the relevant field of study.

8 See Brusco (2012, pp. 173 ss).

9 For further information about the Daubert trilogy, see Merlino *et al.* (2013).

The second case-law: General Electric Co. v. Joiner (1997)

In this case-law (Bernstein and Jackson, 2004), the evidence given was disputed for admissibility and the final decision was against Joiner. The exclusion of expert evidence followed, as the Supreme Court deemed correct given its precedent, namely Daubert. In a holistic assessment of the evidence, where they combine as pieces of a mosaic or crossword puzzle, it may be that no one taken individually meets a certain decision standard, but that everything does. An atomistic assessment of epistemological reliability and legal eligibility led to a result that could have been different from a holistic perspective, as suggested by Judge Stevens' dissent, there is a puzzling passage in the thesis of the Federal Court. Daubert's case insisted that screening should be based exclusively on the principles and methodology, not on the conclusions they generate. Joiner said the conclusions must be considered too much, because «conclusions and methodology are not entirely distinct from each other». What makes sense of this statement is the fact that, apparently, Joiner's experts had followed the same methodology as General Electric's experts; this would have been embarrassing for an exclusion on the basis of methodology alone. As a result, the Carpenter's Court partly departed from Daubert in this regard. Thus, in Joiner the critical questions were neither about credentials nor about the methodology of the experts. They were about the results, the conclusions of the studies. For those concerned with inexperienced gatekeeping, this is a major concern if judges end up being accountable for both methodological evaluation and merit assessment.

The last case-law of the trilogy: Kumho Tire Co. v. Carmichael (1999)

In Kumho (Helland and Klick, 2012), the appeal decision argued that Daubert's factors applied to scientific testimony, not to other forms of it such as testimony based on technical or professional skills (*e. g.* engineers). Carlson claimed to be able to detect defective tires «visual and tactile inspection» (more on this below). The Supreme Court has admitted that some expert testimony is not «scientific» in the strict sense. Expert opinion based on skill or experience may be lower than the criteria that define «science» in the strict sense. However, the Court argued, Daubert is applied not only to scientific, but to any expert testimony. (One of the reasons for this conclusion was to avoid the trouble of drawing a clear line dividing science and technical knowledge or other specializations.) Any expertise has to be not only pertinent but also reliable. The Court insisted that the investigation under Article 702 (as interpreted in Daubert) is flexible. Indeed, these factors do not necessarily all apply even in any case where the reliability of scientific testimony is disputed. It may not be surprising in a particular case, for example, that a statement made by a scientific witness has never been peer reviewed, because the particular application in question could never have affected any scientist. Nor, on the other hand, the presence of the general

acceptance factor of Daubert helps to prove that the testimony of an expert is reliable where the discipline itself lacks reliability, as, for example, theories based on any so-called generally accepted principles. At the same time, some of these factors can help to assess the reliability of even the testimony based on experience: in some cases, it will be appropriate for the trial judge to ask, for example, how often the experience of an engineering expert-the based methodology has produced incorrect results or if such a method is generally accepted in the relevant engineering community.

After Kumho, the U.S. Congress decided to change the text of the rule to make it explicit. Now the expertise must be «the product of reliable principles and methods» (United States, 1975, 702[c]), and it can be admitted if «the expert has reliably applied the principles and methods to the facts of the case» (United States, 1975, 702[d]).

2.1. Franzese's judgment and its rules

The echoes of the trilogy were also significant in Italy with the cases of Franzese and Cozzini (Cass. Pen., SS.UU. 11 settembre 2002, n. 30328; Cass. Pen., Sez. IV, 17 settembre 2010, n. 43786).

The principle beyond any reasonable doubt is the rational element of the presumption of innocence of the legal order. Its repercussions, besides falling on the procedural level for the decision of the judge on the guilt or not of the accused on the basis of the evidence against the accused supported by the Defense and to discharge, fall under substantive criminal law in the theory of crime. More specifically in the causal link between conduct or omission and event attributable to the active subject, agent. In that case, reasonable doubt should shed light on theories supporting the majority criminal causality, the scientific one according to the parameters provided by the Franzese Judgment[10] as well as the transposition of the canons of judicial epistemology overseas found in the judgment in Re Daubert 1993[11], especially from the Daubert trilogy[12].

The judgment of the United Chambers Franzese, instead, has identified an unprecedented welding point between principles and procedural rules never previously linked in this way. The most complex element of the crime to be ascertained, first of

[10] See Cass. pen., SS.UU., 11 settembre 2002, n. 30328. It is not allowed, especially from the epistemic point of view, «to deduce automatically and proportionately from the statistical probability coefficient expressed by the law of coverage the confirmation of the hypothesis», especially when it comes to the use of a «notion» weak even if always of a statistical test per sample, therefore the doubts about the correctness are not groundless (*rectius*, justification) of the inference which led to the finding that the causal link of an injurious event was established from the incidence of the case in similar cases.

[11] See *Daubert v. Merrel Dow Pharmaceuticals, Inc*. (1993).

[12] See *Daubert v. Merrell Dow Pharmaceuticals, Inc*. (1993); *General Electric Co. v. Joiner* (1997); *Kumho Tire Co. v. Carmichael* (1999).

all, has forced the criminal process to compete with scientific evidence: ever since the nomological-deductive model of subsumption undercover scientific laws has been adopted, causality has become the elective ground of «expert» knowledge. Secondly, the need to harness the discretion inherent in establishing the causal relationship has led to a very strong push towards the *juridization* of the concept of reasonable doubt.

The Franzese judgment made the test by exclusion a structural component of causal reasoning, proposing a procedural method capable of overcoming the aporia of the principle of under-determination. As is well known, in the world of science this principle means that the observed data do not decisively determine the explanatory theory, because they are compatible with multiple explanations.

Well, net of the skeptical conclusions that this principle in its original formulation could produce on the heuristic scope of the attempt at falsification, we must reason constructively, focusing attention on the potential inherent in the application of similar insights to the criminal process. If it is true that the roster of reconstructive hypotheses can be reduced by widening the field of observation and excluding those that become incompatible with the new data collected, once dropped in the criminal trial, this method leads to the conclusion that it is the evidence that allows the identification of the applicable scientific law, allowing the attempt to deny. Similarly, it is the evidence available to allow the identification of the maxima of experience suitable to provide the explanation of the concrete case.

From the point of view of epistemology in the strict sense, the thorny issues related to causality have made it possible to identify the rouge file that runs between contradictory, trial of parties, presumption of innocence, burden of proof: the attempt to disprove, set within the accusatory system, constitutes its essence.

The Franzese judgment has sculpted the concept of logical probability as a specific criterion of the criminal process which constitutes the summation of all the lists of profiles and is characterized by its qualitative and non-quantitative character, by its nature of method, of «path of truth» which is based on «intersubjective procedures of verification and falsification». The further passage—to underline because it is anything but obvious—is given by the bi-univocity of the relationship between causality and the general theory of proof.

On the one hand, it was the modernity of the «right of evidence», widely understood, to allow the elimination of that sort of blackout that in some cases had been identified with reference to the ascertainment of causality, sometimes slipping into the intuitionism of the judge. In addition, profiling real cases «to binding expertise» up to clash with the impasse of the percentage of statistical validity of scientific law. In another respect, the need to confront causality and scientific evidence has determined an evolution in the field of general theory of proof that puts Italy at the forefront of the international scene.

The acquisitions achieved go beyond science and invest any inferential reasoning, although based on maxims of experience (and in this regard it is trivial to note that

it is not only the circumstantial evidence that is involved but also the representative evidence that, inevitably, in judging the credibility of the source and the reliability of the statement cannot disregard inferential reasoning based on maxima of experience and scientific laws). Ultimately, the epistemological process of modernity gives us reasonable doubt as a method of training and evaluation of evidence.

This is not a logical leap: talking about judicial knowledge, about how the judge reconstructs the historical fact means discussing methods. It is before the authentic meaning of the concept of *gnoseology*, philosophical term equivalent to *theory of knowledge*: the task of gnoseology is to provide a definition of knowledge, to identify its possible objects and, above all, to study the ways in which it can be acquired by the knowing subject, verifying its validity.

The reasonable doubt, therefore, *ex ante* requires that the test must be formed in a certain way and *ex post* requires the provision of rules governing the evaluation of the available evidence, accrediting the validity of the acquired knowledge.

Unlike any other state activity, in the case of criminal jurisdiction it is not from the results that one can judge the acceptability of a method, but from the method that one can establish the acceptability of the results.

The Court of Cassation has explained the principle of beyond reasonable doubt after having recently examined a question relating to the assessment of the evidence in order to render effective, logically and legally, the judgment of guilt[13].

The rule of judgment inherent in art. 533, paragraph 1, C.P.P. 1988, requires the court to use a dialectical method of verification of the accusatory hypothesis according to the criterion of doubt, with the consequence that the court must verify the non-existence or the existence of internal doubts (*i. e.,* the self-contradictory or its explanatory incapacity) is of doubts external to the same (*i. e.* the existence of an alternative hypothesis equipped with rationality and practical plausibility)[14].

It has been made clear that this principle, however, has in no way changed the nature of the Supreme Court's control in the reasoning of the judgment and cannot, then, be used to enhance and make decisive the duplicity of alternative reconstructions of the same fact, possibly emerged in court and highlighted by the defense, once this duplicity has been carefully examined by the court of appeal[15]. The sentence beyond any reasonable doubt implies, in fact, in the case of presentation of an alternative reconstruction of the facts, the need to identify the elements of confirmation of the reconstructive hypothesis accepted, so as to bring out the irrationality of the doubt arising from the alternative hypothesis itself, since such a doubt cannot be based on a hypothesis that is entirely conjectural, albeit plausible[16].

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[13] See Cass. Pen., Sez. II, 30 giugno 2022, n. 25016.
[14] See Cass. Pen., Sez. I, 24 ottobre 2011, n. 41110.
[15] See Cass. Pen, Sez. IV, 7 giugno 2011, n. 30862; Cass. Pen., Sez. IV, 25 marzo 2014, n. 22257.
[16] See Carnap (1966 p. 11); Gorla (1951, p. 405); Habermas (1992, p. 34); Balsamo (2017, p. 92).

2.2. Cozzini's judgment and the falsification theory

The Court of Cassation accepted the criteria for the reliability of the scientific method and extended them to the requirements of verifiability, falsification, submission to the control of the scientific community, knowledge of the error rate, the general acceptance in the community of experts, the reliability and independence of the expert, the consideration of the purposes for which it operates, the possibility of formulating criteria of choice between the opposing scientific theses[17].

The Cozzini judgment (Cass. Pen., Sez. IV, 17 settembre 2010, n. 43786) states that scientific reasoning is therefore a dialogue between two voices, one imaginative, the other critical; a dialogue between the possible and the current, between the proposal and the reality, the hypothesis and the criticism, between what can be true and what is in fact[18].

This judgment has several implications.

The first concerns the activity of the judge of merit, whether scientific complexity etc. of the case requires it, the judge must be vigilant both in the admission phase, favoring the presence of experts who can be useful, and preventing that of experts only self-styled in a manifest manner (ex art. 190, paragraph 1, C.P.P. 1988), and remedying any incompleteness of the parties on the point (ex art. 507 C.P.P. 1988); both in the recruitment phase, giving order and participating in a neutral way in the comparison between the parties on the intrinsic plausibility and application of the criteria proposed by the respective experts and/or the office expert (ex art. 497 ss. C.P.P. 1988, recalled by art. 501 C.P.P. 1988); both in the evaluation phase, in the terms already indicated, in particular at the end of the previous point (in part. ex art. 192, paragraph 1, 546, paragraph 1, lett. e), C.P.P. 1988).

The second concerns the control by the Supreme Court of the actions of the judge who delivered the judgment under appeal. The court of merit is called to say if the specialized criterion proposed by the expert in judgment satisfies the requirements Cozzini, let alone for which reasons (*e. g.*: because the expert is a well-known specialist on the issue at issue; because his main articles on the subject boast the highest number of citations worldwide); that of legitimacy, on the other hand, it must check that the former has actually set out those reasons and that they are reasonably reasonable. The judge of legality shall review the reasoning that the judge of merit has carried out to check the expert's reasoning. All this means, among other things, that the judge of legitimacy cannot be a judge of the specialized probative criterion, even in United Chambers, being only a judge of the specialized probative reasoning.

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[17] Cass. pen., sez. IV, 17.09.2010, dep. 13/12/2010, n.43786.

[18] See Blaiotta (2010, pp. 372 ss).

The third concerns the consequences of the possibility that, as a result of increasingly intense scientific and technical progress, the sentences passed in the final, acquittal or conviction, discoveries that can overturn the judgment on the specialist evidence underlying them. In this regard, two points can be identified. On the one hand, the main source of legitimacy of a *pro reo* revision is offered by art. 630, lit. c), C.P.P. 1988, which provides for the hypothesis of the discovery or occurrence of «new evidence». On the other hand, this hypothesis, also for the systematic connection with art. 637, paragraph 3, C.P.P. 1988, according to which the revision cannot be based simply on a «different evaluation of the evidence taken in the previous judgment», must be understood in strict and revolutionary terms to which their use leads.

The last implication concerns its feasibility by the jurisprudence because the judges of merit demonstrate to be able to govern complex events, despite their strictly technical-legal training.

The criteria listed in the Cozzini judgment are set out as follows (Cass. Pen., Sez. IV, 17 settembre 2010, n. 43786) [19]:

— it must be ascertained whether a scientific law is sufficiently established in the scientific community on a sound and objective basis;

— it is necessary to determine whether there is universal law or only probability in the statistical sense;

— if the explanatory generalization is only probabilistic, it will be necessary to clarify whether the accelerator effect has been determined in the specific case in the light of defined and significant factual acquisitions;

— from the point of view of the judge, who resolves cases and examines bitter conflicts, the identity, the undisputed authority, the independence of the subject who manages the research, the purposes for which it operates are of paramount importance. Having assessed the methodological reliability and integrity of intentions, it is finally necessary to pull the strings and assess whether there is a sufficiently reliable and concrete theory, meaningful and reliable information to support the evidentiary argument inherent in the specific case examined. In short, a theory on which there is a preponderant, shared consensus.

3. THE ITALIAN AND ANGLO-AMERICAN DOCTRINES ON THE BARD: A COMPARISON

The Italian legal system identifies the criterion of reasonable doubt in art. 533, paragraph 1, Italian Code of Criminal Procedure (C.P.P., 1988). It imposes to pronounce sentence when the acquired probative data leaves out only remote eventualities, but whose concrete realization in the concrete case does not find the slight-

[19] See Tuzet, (2016, pp. 46 ss.).

est confirmation in the trial emergencies, placing itself outside the natural order of things and the normal human rationality (Edgington, 1985, p. 559). The rule of beyond reasonable doubt has definitively undermined the jurisprudential orientation, according to which, in the presence of more than one hypothesis of reconstruction of the fact, the judge was allowed to adopt one that led to the conviction only because he considered it more probable than the others. This will no longer be allowed because, in order to arrive at a conviction, the judge must not only consider as not probable the possible different reconstruction of the fact that leads to the acquittal of the accused but must also consider that the doubt on this alternative hypothesis is not reasonable: that is, it must be an implausible hypothesis or lacking any confirmation (Laudan, 2003, p. 316).

Article 533 C.P.P. 1988 implies, in the case of an alternative presentation of the facts, that the elements of confirmation of the accepted reconstructive hypothesis are identified, so that the non-rationality of the doubt deriving from the alternative hypothesis results, with the specification that the reasonable doubt cannot be based on a conjectural hypothesis. In fact, the reasonable doubt must be based «on elements of fact which make possible an alternative reading of the probative value of the same elements of fact used for the reconstructions, depriving the other reading of convincing univocality» (Canzio, 2004, p. 306).

According to Italian doctrine and jurisprudence the constitutional principle of the presumption of innocence pursuant to art. 27 paragraph 2 and the culture of evidence and its evaluation, underline that the conviction is possible only when there is the procedural certainty of the responsibility of the accused (Stella, 2004, p. 92).

US doctrine and jurisprudence has gone through a constant evolution of the principle of reasonable doubt over the years.

In the case of *Moran v. Ohio* (1984) it is stated that proof beyond any reasonable doubt must also cover the absence of self-defense, which is an element of any charge of aggravated murder. The circumstances affecting the punishment must be evaluated according to the rule of beyond reasonable doubt, through the Sixth and Fourteenth Amendments (Constitution of the United States, 1788) concerning, respectively, the right to a fair trial and the right to trial by jury, that impose a solution in terms of «high level of persuasion» as a parameter to be referred to each of the elements of guilt (Mcnaughton, 1955, p. 1384). It emerges, with clarity, how the rule of judgment gives effect to the presumption of innocence, which, although not expressly sanctioned in the Federal Constitution, represents an obvious corollary of the guarantee of due process (Sheppard, 2003, p. 1175). Once again, therefore, it is reaffirmed the strongly guaranteeing scope of a criterion that is the defense of principles of justice rooted in the depths of human traditions and consciences, starting with the procedural protections, historically enshrined in the Bill of Rights. The priority aim is to give absolute importance to the principle of legality, even at the cost of sacrificing the need for repression. In fact, the need for punishment inevitably yields in front of the protection of the innocent, because it is imposed by irrepressible considerations of value

that are fundamental to the very administration of justice in any truly democratic system. The *Cage v. Louisiana* (1990) judgment of 1990 defines reasonable doubt as any possible doubt based on mere conjecture (Newman, 1993, p. 107). Traditionally accepted is the definition of reasonable doubt found in section 1096 of the California Penal Code (1872) (Kadish *et al.,* 2016, p. 87), relating to the American O. J. Simpson case. Judge Ito of the Los Angeles Court, in his instructions to the jury, writes that reasonable doubt is that situation which leaves the minds of the jurors in such a condition that they cannot be said to feel an unshakable conviction as to the truth of the charge (Ramadan, 2003, pp. 233-252). Emblematic is the statement of juror Aschenbach, who was firmly convinced of the guilt of the defendant and yet was forced by law to vote in the opposite direction (Ramadan, 2004, p. 65). What is required of the jurors, in fact, is not to state how convinced they are of the guilt, but to assess whether or not the prosecution's evidence meets the criterion of reasonable doubt.

It is well known that the BARD's rule doesn't establish a precise criterion for evaluating the evidence, being hinged on an essentially soft concept such as the reasonableness of the doubt that can prevent conviction, even in the presence of evidence of the guilt of the accused (Minhas, 2003, p. 122). The different and variable interpretations that have been given by the courts of civil and common law are not convincing and it is not even possible to verify whether and how the rule is actually applied. It is also known, in fact, that judges refer to it when giving instructions to juries, but as we know the U.S. jury decides in secret, without the presence of the judge, and the verdict is not motivated. Thus, there isn't justification for the way juries interpret the reasonable doubt criterion. Consequently, it is impossible to derive from the North American BARD the formula for a possible definition of the criterion set forth in article 533 of the Italian Code of Criminal Procedure (C.P.P 1988) (Paulesu, 2009, p. 85).

4. BAYES' THEOREM: THE FAILED ATTEMPT OF THE PROBATIVE VALUE MODEL (EVM)

The proof problem is not interpretable according to Bayes' theorem. Bayes' theorem is the logical-probabilistic function that describes the proper procedure for reviewing confidence toward a hypothesis in light of a body of evidence (Callen, 1982). Thus, it is a method of calculating the probability of hypotheses that quantifies not only the preponderance-of-evidence canon of the civil trial, but also the beyond any reasonable doubt canon (Allen, 1994, p. 616). In the criminal process, the application of a Bayesian model allows one to verify whether the personal probability that the version of the prosecution is true compared to the version of the defense and, at the same time, imposes the verification that the critical threshold of probability (reasonable doubt) is exceeded. Bayes' theorem assesses the impact of a given piece of evidence on a judge's personal degree of belief in relation or a given reconstructive

hypothesis. It is considered as a method of review when there is information of an event, and new data is obtained. In the logic of reasonable doubt, proof of innocence does not work simply because it is not necessary. In contrast, proof beyond a reasonable doubt of the falsity of a hypothesis does not differ in its methods of ascertainment and difficulty from proof of its truth (Pardo, 2010, p. 1455). The difference lies in the fact that, while for the purposes of conviction such an intellectual and economic effort is reasonable, the proof of innocence appears completely unnecessary and uneconomical, since the process is called to examine only the propositional truth of the charge (Anderson *et al.,* 2005, p. 334). The Bayesian concept has found a concretization in the Evidentiary Value Model (E.V.M.), a Swedish model developed to resolve the doubts raised by the codification of the concept of free and rational conviction of the judge (Kuhn, 1962) [20]. The intent of the model is the algorithmic management of complexity through the causal explanation of an event as a function of a given evidence (Allen, 2011, p. 1054). This model maintains the idea that belief in a hypothesis is quantifiable and that Bayes' theorem represents the basic model for calculating the evidentiary weight of a single piece of evidence. The E.V.M. therefore proposes to define judgment as an evaluation of the «evidentiary relationship» between the accusatory hypothesis and the compendium of evidence acquired. However, it excludes that the formation of a belief lies in a mere statistical determination of the probability of observing a hypothesis in the light of evidence. Thus, the judge is not primarily concerned with establishing the truth of the *factum probandum*, but with establishing that there is an adequate «evidentiary relationship» as to the presence, or possible presence, of a causal or logical link between the evidence and the subject since even a high degree of belief in the truth of an accusatory proposition «beyond a reasonable doubt», has judicial value only if it is established on the basis of an adequate evidentiary relationship that justifies it (Allen, 1991, p. 410). Evaluating the evidence would mean estimating the probability that individual pieces of evidence from time to time prove the hypothesis. In dynamic terms, the Evidentiary Value Model allows one to combine the different values of the evidentiary relationship of the individual pieces of evidence acquired with respect to the hypothesis, where the relationship between each individual evidentiary value is disjunctive and independent since the question is not whether all of the evidentiary facts prove the issue but whether some of them do. However, this cognitive model fails. In fact, the justification of a belief placed at the basis of the motivation must never result in a mere identification of the causal law capable of explaining the greatest number of similar hypotheses (Tillers and Green, 2003, p. 49). The doubt as to the conduct of the crime must be compatible with the conviction, if it is in any case certain that the defendant committed the crime in question. Otherwise, it would be an abnormal expansion of responsibility, in violation of the guarantee of responsibility for one's

[20] The standard analysis with scientific method provides three syllogisms: deduction in which the conclusion is unknown, induction in which the major premise is unknown, abduction in which the minor premise is unknown.

own actions (Allen and Pardo, 2008, p. 259). For this reason, the statistical data on which bayanism is based must be supplemented, transubstantiated and possibly disproved by the peculiarities of the concrete case, whose probative force doesn't seem to be numerically quantifiable.

Thus, it is possible to outline a generic formula applicable to law.

If P(A) is the probability of A and P(B) is the probability of B, then the conditional probability of A given B is P(A|B) and the conditional probability of B given A is P(B|A). Bayes' theorem says that P(A|B) (Efron, 2013, p. 1-3).

It is well known that the misclassification error rate is minimized if each instance is classified as a member of that class for which its conditional class posterior probability is maximal. Consequently, the naive Bayes classifier is optimal, in the sense that no other classifier is expected to achieve a smaller misclassification error rate, provided that the features are independent (Berrar, 2008).

5. PREMISES OF A NEW THEORY BETWEEN INTERNAL DOUBT AND EXTERNAL DOUBT

The analysis conducted so far leads to the necessary comparison between the most influential theories on reasonable doubt in order to formulate the most acceptable doctrine. There are two doctrinal problems to be addressed: the first is related to the principle of non-contradiction, the second to the principle of probability (Black, 1984, p. 112).

In the first place, a «reasonable doubt» can only derive from an evidentiary insufficiency or contradiction, since logical-subjective doubts remain unreasonable. This derives from the possibility of hypothesizing an alternative explanation independently of the evidence acquired, since, however sustainable from a rational point of view, it would remain purely theoretical. To acknowledge the existence of the causal link, it is sufficient to find an appreciable probability, even small, that the conduct of the agent has contributed to causing the event (Laudan, 2006, p. 77). In the Franzese judgment the criterion of reasonable doubt represents the limit of the judge's freedom of conviction in order to avoid that the outcome of the trial is left to discretionary, subjective and arbitrary assessments. The principle of beyond a reasonable doubt is expressed in the fundamental guarantees of the criminal process, including the presumption of innocence, the *in dubio pro reo* and the obligation to motivate, which is guaranteed by the control ex art. 606, paragraph 1 letter. e) cpp (Iacoviello, 2006, p. 3869).

The second strand concerns the issue of probability through the mathematical form with which scientific evidence is presented in a courtroom. The use of quantitative data contributes more and more frequently to the probative reconstruction of the facts, but not without questions, still unanswered, regarding the «certainty» or

objectivity of their conclusions (Saini, 2009). While it is undoubtedly true that the introduction of objective measures of certain measurable and quantifiable events can increase the reliability of the evidence presented in a trial, it is not possible to affirm that it is always guaranteed, at a cognitive level, the precise awareness and therefore their appropriate use during the course of the judicial decision (Fiandaca, 2005). The human mind is intrinsically unable to process probabilistic information. According to the evolutionary hypothesis, if non-experts are incapable of estimating the probabilities of single events, they should, however, otherwise be able to provide correct frequency predictions (Kahneman, 1999, p. 14). Indeed, even if our ancestors could not observe the probabilities of single events, they were nevertheless able to observe the repetition of actual events and record their frequencies. Consequently, assuming that natural selection has endowed the human mind with an innate mechanism for dealing with frequencies, individuals can be expected to be able to solve probabilistic problems in which numerical information expresses frequency values. Against the prospect of an ideal decision maker, capable of making normatively accurate choices, it has shown that people are not always able to correctly assess probabilities (Kahneman, 1999, p. 32). The story must be authorized by the facts, namely the evidence. Public prosecutor and defendant must not invent a story but tell a story in which the people involved and the actions taken are connected by temporal (the when) and causal (the why) links (Allen, 1997, p. 266). The construction of a story, therefore, assumes a fundamental function of organizing the evidence that has been presented, during the trial, in a chronologically disordered and not always exhaustive way (the evidence has different evidentiary value, is presented on different days and the witnesses are not always accurate): this «systematization» is able to facilitate the understanding of the case and allow judges to formulate a verdict, but also, potentially, to misunderstand or alter it. Once the indictment has become history, it will be easier for the judge to check its credibility in light of the criterion of the ordinary course of human affairs. Congruence is more than mere non-contradiction. The congruence of a hypothesis is its verisimilitude. A story is congruent and plausible precisely because it is verisimilar: that is, it reflects the usual order of things. They are «human story plots», which according to the experience and cultural patterns of a given era appear «logical». They are mental schemes, cognitively internalized by each individual, through which to perceive and interpret the events of everyday life (Kahneman, 1999, p. 18).

6. EPISTEMOLOGICAL STRUCTURE BETWEEN JUDGMENT'S GROUNDS AND BARD'S RULE

When the judge is forced, or wants to make even two syllogisms, the door is opened to uncertainty[21]. In the light of the above considerations, one can formulate

[21] See moreover the essential literature in this field: De Finetti (1970, p. 34); Cohen (1977, p. 56)

a theory of reasonable doubt based on the combination of legal dialectics and jurisprudence.

The demonstrative reasoning assumes the complete rationality of the decision, as it derives from the application of the codified rules to the ascertained fact. Alongside this is the possibility of inductive reasoning, which admits conclusions with a different gradation of truth-falsehood. Ergo, reasoning refers to the universe of probability and no longer to that of absolute certainty. The legal argumentation, however, is a particular type of inductive reasoning, because while usually by induction, it means a logical argument that starts from particular premises to reach a universal statement, in this theory is highlighted the inductive generation of a general hypothesis, from specific cases (Laudan, 2010, p. 23). Legal reasoning is therefore an abductive type of reasoning, which proceeds from the particular, *i. e.* the evidence, to another particular, *i. e.* the probability that a hypothesis, such as the statement «X has killed Y», is true. The abductive generation of an explanatory hypothesis for a particular case is based on its similarity to other cases that have previously supported an inductive maxim: the thinking involved is not associative, but analogical (Carlizzi, 2019). Starting from uncertain premises, the conclusions of abductive reasoning are not about the probability of an event, but about the probability of a hypothesis, more correctly, the probability, beyond a reasonable doubt, that a hypothesis, the imputation, is true (Caprioli, 2009, p. 77). The principle of jurisprudence applied to the evidentiary process is essential to understand this theory because in every crime the judge must express himself with a perfect syllogism (Allen *et al.*, 2006, p. 91): the major premise is the general law; the minor premise is the action conforming or not conforming to the law; the conclusion is freedom or punishment. Abductive legal reasoning is thus linked to the concept of probability. To conclude the thread of the argument, therefore, the inductive and abductive quality of legal reasoning, connoted primarily and predominantly by the notion of probability, is linked to that of doubt. Such thinking makes the logical certainty of the deductive conclusions of the judicial syllogism unreliable.

Legal abduction, according to a fallibilist approach in epistemology, is a reconstruction of what happened with a public confrontation of hypotheses through shared criteria and principles. The trial is the means of a public reconstruction, and the abduction is one of the processes of verifying or falsifying the hypothesis regardless of any principle of method (on the criteria of hypothesis formulation and selection) (Tuzet, 2023).

The introduction of the rule of beyond all reasonable doubt imposes on the judge a «dialectical method» of verification of the accusatory hypothesis according to the criterion of «doubt»: in essence, the verification of the hypothesis of the accusation by the judge must be carried out in such a way as to avert that there may be internal or external doubts to the same. Thus, according to this perspective, reasonable doubt about the prosecutor's hypothesis, which prevents conviction, may be of two types: internal or external. Internal doubt is that which reveals the prosecutor's inconsist-

ent hypothesis that explains only some facts, but not all the facts necessary for a judgment of guilt. External doubt, on the other hand, is an alternative thesis to the prosecutor's hypothesis that is not a possibility. Consequently, a conviction can only occur if the barriers of this dual doubt are overcome.

The logical structure of a legal decision is the practice of inverting the decision and its reasons, it's a practice of reasoning (Tuzet, 2023, pp. 167 ss.).

A judicial decision is a right decision if it is determined on the basis of the facts ascertained. Essentially, a judicial decision is a right one if factual premises are true and normative premises are morally acceptable. Now, concerning the first condition, justice follows from a true account of the facts. There cannot be justice without truth. There cannot be a right decision on the basis of a false reconstruction of what happened or matters. In observance of the truth, those legal consequences should be determined which normatively follow from the facts ascertained (Canale and Tuzet, 2007).

So the legal and scientific abduction (Haack, 2015, pp. 128-135):

— provides for the best explanation of what happened;

— concerns the relation of truth and proof, their opposition is a false one, because a proof is a proof of the true, and a limitation of the patterns of investigation does not change its goal;

— in the adversary model, is public;

— if it is true that the parties on trial are in conflict, it is true that the judgment should regard the truth or falsehood of their arguments.

7. SCIENCE AND JUDGMENT'S GROUNDS

The judge must not examine the scientific content, but the scientific criteria. The reasoning is not immune from the apparent defect. We must, therefore, avoid that the logical probability becomes a *post hoc*, *propter hoc* masked (Nobili, 1992, p. 14). There is a need to maintain the generality of the maxim of experience, warning of the risk that we end up building a maximum of experience that is nothing more than a repetition of the concrete case under consideration. In a case where it was necessary to establish the causal link between a brain injury caused by a road accident and the subsequent destructive sexual behavior, the Supreme Court based the reduction of the conviction's judgment from life imprisonment to twenty years on rather problematic scientific evidence, affirming that the criterion of *«more likely than not»* operates in the evaluations carried out[22]. On the one hand, we must beware of the temptation of artificial intelligence, which is ontologically incapable of replacing

22 See following Italian Supreme Court jurisprudence: Cass., Sez. I, 18 marzo 2019; Cass., Sez. I, 29 marzo 2020; Cass., Sez. I, 28 agosto 2020; Cass., Sez. IV, 12 giugno 2012, n. 23147; Cass., Sez. IV,

human judgment, on pain of a fatal arithmetic reductionism that opens up a sci-fi framework of «machine rebellion». On the other hand, acclaimed as the judge's decision constitutes a *mixtum compositum* of reason and emotion, it is essential to legalize the conviction.

If instead we consider a rule on human action, there is only that specific human occurrence in its singularity and unrepeatability that puts us in front of different and unpredictable decisions based on the same elements and that to present the errors and distortions that can undermine the reasoning of the judge in order to avoid them and on this there are «extralegal» disciplines that can provide valuable help. To stem the degeneration of emotions opens the field of cognitive psychology that studies the systematic distortions of knowledge (think of the c.d. tunnel vision or confirmation bias and the c.d. Prosecutor fallacy or rule of inusuality) [23].

On the front of reasoning, the logic and philosophy of language can come to the rescue where the c.d. fallacies of reasoning are highlighted (distinguishing between fallacies from the illogicality of argumentation and the fallacies of inductive or probabilistic reasoning). It should be considered that—as a demonstration of the composite nature of human reasoning—there are grounds in which the cited disciplines reveal overlaps. These are profiles that deserve a specific application to legal reasoning, also because the aspects of overlap should be investigated with appropriate cognitive tools. Net of these last considerations, the clarity about the typologies of errors, in which it can incur, *ex ante* can avoid that it is fallen and *ex post* can allow to who is called to control the reasoning to identify them and to put to you to remedy. Today this appears to be the only reassuring path to follow in every field possible solutions of «decision hygiene» based on corrective protocols.

In a criminal case, the relevant fact should be proved «beyond reasonable doubt»; while in civil cases the standard is less high. This is true, but independently of the standard, a proof is always taken as a proof of the truth. Truth is the main goal of legal inquiry and abduction is a valid reasoning because the problem concerns the evidence and not the reasoning. It is a probable inference, that is an inference determining conclusions whose truth does not necessarily follow from the truth of the premises. It is indeed a principle of responsibility. The knowledge of the uncertainty of abductive conclusions means the responsibility for their inference. The knowledge of the lack of certainty of a certain piece of reasonin means the impossibility of concealing an arbitrary decision under the shield of logic (Tuzet, 2016, pp. 195-209).

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20 giugno 2011; Cass., Sez. V, 20 aprile 2017; Cass., Sez. IV, 14 aprile 2016; Cass., Sez. VI, 5 febbraio 2014.

[23] See Iacoviello (1997, p. 239).

8. SCIENTIFIC EVIDENCE AND ITS RESISTANCE AGAINST BARD'S RULE

The evaluation of evidence and free conviction is controllable through the method that governs it and must be controlled by virtue of the preceptive value of reasonable doubt. The summary of «legal and rational motivation» starting from norms such as art. 192 and 546, lett. e), C.P.P. 1988. It is precisely the drafting of the reasons that allows us to express the evaluation method used, starting a path of understanding and sharing of the same thanks to the existence of the system of controls. Again, the key is the attempt to deny that, in addition to articulating the structure of the criminal trial, must usually constitute the judge's way of reasoning. The attempt to falsify, implemented at the level of the probative method through the dialectic of the trial, has always been reflected, in the c.d. dialogical structure of the motivation that—today in compliance with the canon of clarity—must explain the reason why the judge has formed a certain conviction based on certain evidence (the why yes) and the reasons why he excluded the conclusions that would be drawn from the other evidence (why not).

The prosecutor formulates the best reconstructive hypothesis, the impact of the adversarial debate passes it to the scrutiny of falsification—it is also necessary articulation of the reasoning of the judge that must then be reflected in the motivational apparatus. It can, therefore, be said that, for thirty years, the code incorporates a model of motivation with a recognizable and informed structure to a very clear epistemological approach. art. 546, lett. e), C.P.P. 1988 which, in this respect, shows its true nature as a prescriptive norm [24].

This rule implies a «reinforced dialogue structure» for the motivation: where it specifies that the supporting apparatus must indicate «the results obtained and the criteria for evaluating the evidence adopted by stating the reasons for which the judge considers the contrary evidence to be unreliable» and imposes an attempt to deny any inference (Iacoviello, 2013, p. 338).

The parable appears accomplished: valued to contain the risks associated with scientific evidence, in turn linked to the double thread with the ascertainment of the causality relationship, reasonable doubt has determined the formation of a real science of evidence [25].

Causality can also be proven by maxima of experience, provided the standard of logical probability is reached [26].

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[24] See Capograssi (1959, p. 65).
[25] See Zirulia (2019, p. 1311).
[26] See Dominioni (2005, p. 312).

Scientific evidence is not a tool gnoseologic *sui generis* but it is evidence like all the others: it goes through the contradictory, the process of parts, the partially device principle, the reasonable doubt[27].

Again, the motto of the *«judge peritus peritorum»* expresses a cultural model that is no longer current and, indeed, decidedly anachronistic, at least insofar as it claims to assign to the judge real ability to govern the flow of scientific knowledge that the parties pour into the process.

The result of a scientific test can be considered reliable only if it is checked by the court, at least with regard to the subjective reliability of the supporter, the scientific nature of the method used, the more or less acceptable margin of error and the objective value and reliability of the result achieved such control only if a full contradictory examination is carried out.

With reference SS. UU. (United Sections of Italian Supreme Court) to the scientific evidence, it was then stated that the burden of proof on the correct acquisition of data and on the basis of the theory based on the reconstruction rests on the part that introduces the scientific data. Moreover, the jurisprudence has affirmed that the expert report is not neutral proof because no scientist is neutral and because in the criminal trial it is part of the dynamics of the burden of proof through the comparison between experts who support arguments sometimes in conflict. In this crucial procedural juncture, «the decisive role is highlighted, which, in the context of procedural dialectics, assumes the oral contradiction through which occurs, in the trial, 1) the reliability of the expert, 2) the reliability of the scientific method used and 3) its correct application to the specific case [...] all operations that also allow to distinguish the irrelevant or false opinions of the expert (c.d. junk science) from reasoned opinions on the basis of laws scientifically tested and accredited by the scientific community[28].

As far as scientific evidence is concerned, the right to the contrary must be guaranteed to the greatest extent. In recent arrests, case law is increasingly asserting that, in the event of disagreement between experts, the right to proof arises provided that the contrast is effective and documented. Otherwise, the established principle that the court may rely on expert advice alone would be disproved by a recent jurisprudential arrest that has considered the technical consultant of the prosecutor as a figure teleologically oriented towards the ascertainment of the truth, in the prism of a peculiar reading of art. 358 C.P.P. 1988. Such arguments constitute the sign of the persistent uncertainty on the consistent ubi of the experts, on their obligations and burdens. The reasonable doubt is the alpha and the omega of any reasoning in the matter of proof. The intuition of the judge cannot fill any demonstrative gaps. The correct way of reasoning is not the convergence of the multiple, but the screening

[27] See Frosini (2002, p. 102).
[28] See *Frye v. United States* (D.C. Cir. 1923).

of precision and gravity that—before proceeding further—must be carried out on each circumstance individually considered. Experience maxims should also be denied where they are to be used in representative evidence in assessing the credibility of the registrant and the reliability of the claim.

A theory should not be considered new when empirically but scientifically conducted, of all the available evidence critically examined, as well as an inductive judgment elaborated on the analysis of the characterization of the historical fact and on the particularities of the concrete case, each of the assumptions made are verifiable and verified by the scientific community. The statement is certainly worthy of careful study, with the foresight to recall how lurking there is the risk of incurring the c.d. «fallacy of the composition». It is that error of reasoning that consists in attributing to the whole the properties of its parts, while it is not necessarily that the individual parts, combining each other, maintain their characteristics unchanged.

It is clear, however, that in such cases the need to overcome the criterion of beyond reasonable doubt requires to conduct the assessment of «quality» with the utmost rigor requiring an even stronger motivational apparatus capable of resisting any attempt at denial, especially when the theory itself is based on the reconstruction accepted by the conviction.

The judge of merit is called to evaluate as it were «from the outside» the scientific law, we must pay the utmost attention: in fact, the danger is increasingly real that we are satisfied with an external assessment of the identity of the scientist and the method of formation of the theory he applies, without then establishing whether the scientific theory is convincing in its cognitive content and especially whether it, applied to the present case, produces reliable results.

9. CONCLUSIONS

The identification of the accreditation of scientific law may be based on the conviction. In some pronouncements, in fact, there seems to be a real equation between the criterion of beyond reasonable doubt and the general acceptance of theory in the scientific world, in clear contrast to the acquisitions of the Daubert test that had made the general acceptance a purely residual criterion in the scientific screening. It would therefore be useful to meditate on the cross between the standard of logical probability, the rule of judgment imposed by the BARD criterion and the scientific parameters of theory. This is evidently a necessary consequence of the fact that, in our legal system, these latter criteria find their systematic place of election not so much in the phase of admission of the test as in the phase of evaluation of it and, therefore, they must necessarily confront the rules of evidence and judgment that operate at that stage. Nothing more complex for those who are called to apply it. There is a risk that the new science will be cut off, which by definition does not enjoy the broad sharing of the scientific community by creating a two-speed science. In

reality, the reasoning is affected by the peculiarity of asbestos, in which the theory of the accelerator effect fails to clarify the causal effectiveness of the individual exposure ducts during the period of real latency.

In the same hermeneutic path, in a relationship of speculation, there is uncertainty also with reference to the scientific law that can be based on the existence of a reasonable doubt on the reconstruction of the accusation and that, consequently, can justify the acquittal. On this front, the risk is to base reasonable doubt on the swampy terrain of questionable or even pseudoscientific scientific laws, while it is important to keep in mind that the attribute of «reasonableness» seems even incompatible with the reconstruction of a fact based on unreliable science. It is, therefore, important to identify the boundary line between reasonable doubt and «pseudoscientific doubt», which runs on a ridge really thin and difficult to identify already at the conceptual level.

Evidence is literally incomprehensible without rules of language and logic, but it is simply accepted that an investigator can process information and deliberate on it. The rules of evidence distribute the possible errors of judges favoring in the case of the criminal rule the false negatives (acquittal of the guilty) over the false positives (conviction of the innocent). From this brief discussion the objective of research is partially reached, because through the theory presented in front of a situation in which there is total confirmation of the hypothesis of guilt, it can be considered that the BARD is an additional and final criterion of truth, avoiding the deeply immoral concept according to which condemning a man as a criminal is based exclusively on fixing once and for all a threshold of reasonable doubt because this means to admit a certain threshold of risk of condemning an innocent person.

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