Digital Forensics in the Courts

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I. Definition

A. There is not yet a standard legal definition of "computer forensics" or "digital forensics."

B. *The Sedona Conference Glossary: E-Discovery & Digital Information Management (Fourth Edition)* (April 2014) provides the following definition:

> "Computer Forensics is the use of specialized techniques for recovery, authentication and analysis of electronic data when an investigation or litigation involves issues relating to reconstruction of computer usage, examination of residual data, authentication of data by technical analysis or explanation of technical features of data and computer usage. Computer forensics requires specialized expertise that goes beyond normal data collection and preservation techniques available to end-users or system support personnel, and generally requires strict adherence to chain-of-custody protocols."

C. US-CERT, in *Computer Forensics* (2008), notes "[b]ecause computer forensics is a new discipline, there is little standardization and consistency across courts and industry" and defines it this way:

> "We define computer forensics as the discipline that combines elements of law and computer science to collect and analyze data from computer systems, networks, wireless communications, and storage devices in a way that is admissible as evidence in a court of law."

II. Overview of Digital Forensics

Simson Garfinkel, a respected technologist and author, has written an article that provides a good general overview of digital forensics. It starts with:

> "Since the 1980s, computers have had increasing roles in all aspects of human life including an involvement in criminal acts. This development has led to the rise of *digital forensics,* the uncovering and examination of evidence located on all things electronic with digital storage, including computers, cell phones, and networks. Digital

> forensics researchers and practitioners stand at the forefront of some of the most challenging problems in computer science, including "big data" analysis, natural language processing, data visualizations, and cybersecurity."
>
> "Compared with traditional forensic science, digital forensics poses significant challenges. Information on a computer system can be changed without a trace, the scale of data that must be analyzed is vast, and the variety of data types is enormous. Just as a traditional forensic investigator must be prepared to analyze any kind of smear or fragment, no matter the source, a digital investigator must be able to make sense of any data that might be found on any device anywhere on the planet—a very difficult proposition."

He describes two purposes for digital forensics in different kinds of cases:

> "First, in many cases computers contain evidence of a crime that took place in the physical world. The computer was all but incidental…"
>
> The second class of digital forensics cases are those in which the crime was inherently one involving computer systems, such as hacking. In these instances, investigators are often hampered by the technical sophistication of the systems and the massive amount of evidence to analyze.

Simson L. Garfinkel, "Digital Forensics," *Scientific American* (September-October 2013), available at:
www.americanscientist.org/issues/pub/digital-forensics

III. Qualification of Experts

Federal Rule of Evidence

Admissibility of evidence in federal courts, including expert opinions, is governed by the Federal rules of Evidence (FRE). The core rule in this area is FRE 702.

Rule 702. Testimony by Expert Witnesses

> "A witness who is qualified as an expert by knowledge, skill, experience, training, or education may testify in the form of an opinion or otherwise if…"

As the rule provides, there are several ways that a witness may be qualified to testify as an expert. Relevant experience may be sufficient :

- FRE 702 permits expert testimony from "a witness qualified as an expert by … experience …."

- The Advisory Committee Note to the 2000 Amendment to FRE 702 recognizes that an expert may be qualified based on experience:

  "Nothing in this amendment is intended to suggest that experience alone – or experience in conjunction with other knowledge, skill, training or education – may not provide a sufficient foundation for expert testimony. To the contrary, the text of Rule 702 expressly contemplates that an expert may be qualified on the basis of experience. In certain fields, experience is the predominant, if not sole, basis for a great deal of reliable expert testimony."

  - *United States v. Ganier*, 468 F.3d 920 (6th Cir. 2006) (proposed testimony by FBI forensic computer specialist about what he found on computers, using forensics software, required qualification as an expert under Rule 702 and expert disclosure; this was not a situation where a lay witness may testify based on specialized knowledge)

  - *Nucor Corp. v. Bell*, 2008 U.S. Dist. LEXIS 86328 (D. S.C., Jan. 11, 2008) (court recognized as expert witness an individual who lacked formal education in computer forensics but had "worked with computers for approximately thirty years, in areas (programming and systems analysis) that lend themselves to a knowledge of computer forensics. Moreover, he has been engaged and oversees the operations of a company that regularly engages in computer forensic analysis. He has also provided a list of at least five other engagements where he performed computer forensic analysis for clients, including some jobs that involved trade secrets violations.")

  - *Malibu Media, LLC v. Tashiro*, 2014 U.S. Dist. LEXIS 162653 (S.D. Ind., Nov. 19, 2014) (forensics examiner qualified to testify concerning deleted files, despite lack of education on the subject, where he had experience and was certified on the forensics tools that he used)

  - *XTech, Inc. v. CardSmart Techs., Inc.,* 2014 U.S. Dist. LEXIS 1846000 (S.D. Fla., Dec. 4, 2014) (applying *Daubert* analysis to admit and exclude various opinions on digital forensics analysis and source-code analysis)

IV. **Admissibility of Expert Testimony**

A. *Frye v. United States*, 54 App. D.C. 46, 293 F. 1013 (1923) established the standard that was used by federal courts and many state courts for years.

1. Expert opinion based on scientific technique is inadmissible unless the technique is generally accepted as reliable in the relevant scientific community.

2. Was the leading test for qualifying expert witnesses in the federal courts until Supreme Court ruled in *Daubert v. Merrell Dow*, 509 U.S. 579 (1993) that FRE 702 had preempted it.

3. Still is the qualifying test in some state courts, including Pennsylvania, that have not adopted rules similar to FRE 702 or guidelines similar to *Daubert* and *Kumho Tire.*

B. *Daubert v. Merrell Dow*, 509 U.S. 579 (1993) (FRE 702 provides the standard for admissibility of expert testimony based on scientific technique; requires gatekeeping to determine reliability and relevance – provides for a screening procedure and a more flexible substantive test to be applied in it)

Admissibility is based on a two-step analysis in which the trial court determines:

(1) whether the proffered expert opinion reflects scientific knowledge, whether the findings are derived by the scientific method and whether the work amounts to good science **(reliability)**, and

(2) whether the proffered expert opinion is relevant to the task at hand (**relevance**). FRE 702 governs admissibility of expert opinions. FRE 401-403 govern relevance generally.

For the first step in this admissibility analysis, the Supreme Court provided a list of nonexclusive factors, which it characterized as "general observations," that a court should analyze in determining the reliability of scientific evidence:

(1) whether the scientific theory or technique "can be (and has been) tested";

(2) whether the scientific theory or technique "has been subjected to peer review and publication";

(3) "the known or potential rate of error";

(4) "the existence and maintenance of standards controlling the technique's operation"; and

(5) "general acceptance" in the "relevant scientific community."

The Court pointed out "we do not presume to set out a definitive checklist or test."

C. In *General Electric Co. v. Joiner,* 522 U.S. 136 (1997), the Supreme Court also held that the gatekeeping function is not limited to evaluation of methodology, as it stated in *Daubert*, but also properly includes a review of the connection between the methodology and the expert's conclusions:

> "But conclusions and methodology are not entirely distinct from one another. … [N]othing in either *Daubert* or the Federal Rules of Evidence requires a district court to admit opinion evidence that is connected to existing data only by the *ipse dixit* of the expert. A court may conclude that there is simply too great an analytical gap between the data and the opinion offered."

D. *Kumho Tire Co. v. Carmichael*, 526 U.S. 137 (1999) (FRE 702 also governs admissibility of expert testimony from non-scientists)

E. Pennsylvania still applies the *Frye* standard. See *Grady v. Frito- Lay, Inc.*, 839 A.2d 1038 (Pa. 2003) (*Frye*, not *Daubert*, applies in Pennsylvania; *Frye* does not apply to all expert opinions, only to proffered expert testimony involving novel science)

Copies of the relevant Pennsylvania Rules of Evidence are attached.

F. FRE 702 – Testimony by Experts

1. Rule: "If scientific, technical, or other specialized knowledge will assist the trier of fact to understand the evidence or to determine a fact in issue, a witness qualified as an expert by knowledge, skill, experience, training, or education, may testify thereto in the form of an opinion or otherwise, if (1) the testimony is based upon sufficient facts or data, (2) the testimony is the product of reliable principles and methods, and (3) the witness has applied the principles and methods reliably to the facts of the case."

   Amended in 2000 to codify *Daubert* requirements. See. Advisory Committee Notes to 2000 amendment (attached)

   Copies of the relevant Federal Rules of Evidence and the Advisory Committee Notes on the 2000 amendments are attached.

2. *United States v. Ganier,* 468 F.3d 920 (6th Cir. 2006) (proposed testimony by FBI forensic computer specialist about what he

found on computers, using forensics software, required qualification as an expert under FRE 702 and expert disclosure; this was not a situation where a lay witness may testify based on specialized knowledge)

G. The Advisory Committee Note to the 2000 Amendment to FRE 702 contains a list of additional factors which federal courts have applied in determining the reliability of expert opinions:

1. Whether experts are "proposing to testify about matters growing naturally and directly out of research they have conducted independent of the litigation, or whether they have developed their opinions expressly for purposes of testifying." *Daubert v. Merrell Dow Pharmaceuticals, Inc*., 43 F.3d 1311, 1317 (9th Cir. 1995) (on remand).

2. Whether the expert has unjustifiably extrapolated from an accepted premise to an unfounded conclusion. *See General Elec. Co. v. Joiner*, 522 U.S. 136, 146 (1997) (noting that in some cases a trial court "may conclude that there is simply too great an analytical gap between the data and the opinion proffered").

3. Whether the expert has adequately accounted for obvious alternative explanations. *See Claar v. Burlington N.R.R.*, 29 F.3d 499 (9th Cir. 1994) (testimony excluded where the expert failed to consider other obvious causes for the plaintiff's condition). *Compare, Ambrosini v. Labarraque*, 101 F.3d 129 (D.C. Cir. 1996) (the possibility of some uneliminated causes presents a question of weight, so long as the most obvious causes have been considered and reasonably ruled out by the expert).

4. Whether that expert "is being as careful as he would be in his regular professional work outside his paid litigation consulting." *Sheehan v. Daily Racing From, Inc.*, 104 F.3d 940, 942 (7th Cir. 1997), *cert. denied*, 521 U.S. 1104, 117 S.Ct. 2480 (1997). *See Kumho Tire Co. v. Charmichael,* 119 S. Ct. 1167, 1176 (1999) (*Daubert* requires the trial court assure itself that the expert "employs in the courtroom the same level of intellectual rigor that characterizes the practice of an expert in the relevant field").

5. Whether the field of expertise claimed by the expert is known to reach reliable results for the type of opinion the expert would give. *See Kumho Tire Co. v. Carmichael,* 119 S. Ct. 1167, 1175 (1999) (*Daubert's* general acceptance factor

does not "help show that an expert's testimony is reliable where the discipline itself lacks reliability, as, for example, do theories grounded in any so-called generally accepted principles of astrology or necromancy."); *Moore v. Ashland Chemicals, Inc*., 151 F.3d 269 (5th Cir. 1998) (en banc), *cert. denied*, 526 U.S. 1064, 119 S.Ct. 1454 (1999) (clinical doctor was properly precluded from testifying to the toxicological cause of the plaintiff's respiratory problem, where the opinion was not sufficiently grounded in scientific methodology); *Sterling v. Velsicol Chem. Corp.*, 855 F.2d 1188 (6th Cir. 1988) (rejecting testimony based on "clinical ecology" as unfounded and unreliable).

H. FRE 703 – Bases of Opinion Testimony by Experts

1. Rule: "The facts or data in the particular case upon which an expert bases an opinion or inference may be those perceived by or made known to the expert at or before the hearing. If of a type reasonably relied upon by experts in the particular field in forming opinions or inferences upon the subject, the facts or data need not be admissible in evidence in order for the opinion or inference to be admitted. Facts or data that are otherwise inadmissible shall not be disclosed to the jury by the proponent of the opinion or inference unless the court determines that their probative value in assisting the jury to evaluate the expert's opinion substantially outweighs their prejudicial effect."

2. *Dura Auto. Sys. Of Ind., Inc. v. CTS Corp.,* 285 F.3d 609 (7th Cir. 2002) (while experts may rely on types of information that they generally rely on in the practice of their professions, they may not be a mouthpiece for an opinion of another expert in a different field)

3. *Melendez-Diaz v. Massachusetts*, 557 U.S. 305(2009) ("certificates of analysis" – affidavits from the state's forensic examiners – identifying substances found on a defendant as cocaine were testimonial statements under the Confrontation Clause; the examiners must be present for cross examination)

I. Rule 902 – Evidence That Is Self-Authenticating

An amendment to the FRE that will take effect on December 1, 2017 adds two new provisions on self authentication of digital evidence.

"The following items of evidence are self authenticating; they require no extrinsic evidence of authenticity in order to be admitted:

***

(13) *Certified Records Generated by an Electronic Process or System*. A record generated by an electronic process or system that produces an accurate result, as shown by a certification of a qualified person that complies with the certification requirements of Rule 902(11) or (12). The proponent must also meet the notice requirements of Rule 902(11).

(14) *Certified Data Copied from an Electronic Device, Storage Medium, or File.* Data copied from an electronic device, storage medium, or file, if authenticated by a process of digital identification, as shown by a certification of a qualified person that complies with the certification requirements of Rule 902(11) or (12). The proponent also must meet the notice requirements of Rule 902(11)."

V. Selected Additional Information

Craig D. Ball, www.craigball.com, a website with a wide variety of information on e-discovery and digital forensics.

Craig D. Ball, "Computer Forensics for Lawyers Who Can't Set a Digital Clock" (2011)

Craig D. Ball, "Becoming a Better Witness on Digital Forensics" (2014)

Fred Cohen, http://all.net, a website with a wide variety of information on digital forensics and cybersecurity, including an interactive diagram on the digital forensics and electronic discovery processes (click on "Forensics")

Fred Cohen, *Digital Forensic Evidence Examination* (ASP Press 2009)

Fred Cohen, *Challenges to Digital Forensic Evidence* (ASP Press 2008)

Larry Daniel and Lars Daniel, *Digital Forensics for Legal Professionals* (Syngress 2012)

Daniel B. Garrie and J. David Morrissy, "Digital Forensic Evidence in the Courtroom: Understanding Content and Quality," 12 NW. J. TECH. & INTELL. PROP. 121 (2014)

Stuart C. Gaul, Jr. and Jerri A. Ryan, "Admissibility of Electronically Stored Information," Chapter 10 in *eDiscovery* (PBI Press 2017)

Sean E. Goodison, Robert C. Davis and Brial A. Jackson, "Digital Evidence and the U.S. Criminal Justice System," (RAND Corp. 2015), available at https://www.ncjrs.gov/pdffiles1/nij/grants/248770.pdf

Guidance Software, *EnCase Legal Journal*, 5th Edition (2014)

SANS Institute, Digital Forensics & Incident Response, https://digital-forensics.sans.org

Sharon D. Nelson and John W. Simek, “Digital Forensics Best Practices,” Chapter 8 in *eDiscovery* (PBI Press 2017)

U.S. Department of Justice, *Searching and Seizing Computers and Obtaining Electronic Evidence in Criminal Investigations Manual* (2009)

FEDERAL RULES

OF

EVIDENCE

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ARTICLE VII. OPINIONS AND EXPERT TESTIMONY

Rule 701. Opinion Testimony by Lay Witnesses

If a witness is not testifying as an expert, testimony in the form of an opinion is limited to one that is:

(a) rationally based on the witness's perception;

(b) helpful to clearly understanding the witness's testimony or to determining a fact in issue; and

(c) not based on scientific, technical, or other specialized knowledge within the scope of Rule 702.

(As amended Mar. 2, 1987, eff. Oct. 1, 1987; Apr. 17, 2000, eff. Dec. 1, 2000; Apr. 26, 2011, eff. Dec. 1, 2011.)

Rule 702. Testimony by Expert Witnesses

A witness who is qualified as an expert by knowledge, skill, experience, training, or education may testify in the form of an opinion or otherwise if:

(a) the expert's scientific, technical, or other specialized knowledge will help the trier of fact to understand the evidence or to determine a fact in issue;

(b) the testimony is based on sufficient facts or data;

(c) the testimony is the product of reliable principles and methods; and

(d) the expert has reliably applied the principles and methods to the facts of the case.

(As amended Apr. 17, 2000, eff. Dec. 1, 2000; Apr. 26, 2011, eff. Dec. 1, 2011.)

Rule 703. Bases of an Expert's Opinion Testimony

An expert may base an opinion on facts or data in the case that the expert has been made aware of or personally observed. If experts in the particular field would reasonably rely on those kinds of facts or data in forming an opinion on the subject, they need not be admissible for the opinion to be admitted. But if the facts or data would otherwise be inadmissible, the proponent of the opinion may disclose them to the jury only if their probative value in helping the jury evaluate the opinion substantially outweighs their prejudicial effect.

(As amended Mar. 2, 1987, eff. Oct. 1, 1987; Apr. 17, 2000, eff. Dec. 1, 2000; Apr. 26, 2011, eff. Dec. 1, 2011.)

Rule 704. Opinion on an Ultimate Issue

(a) IN GENERAL—NOT AUTOMATICALLY OBJECTIONABLE. An opinion is not objectionable just because it embraces an ultimate issue.

(b) EXCEPTION. In a criminal case, an expert witness must not state an opinion about whether the defendant did or did not have a mental state or condition that constitutes an element of the

crime charged or of a defense. Those matters are for the trier of fact alone.

(As amended Pub. L. 98–473, title II, §406, Oct. 12, 1984, 98 Stat. 2067; Apr. 26, 2011, eff. Dec. 1, 2011.)

Rule 705. Disclosing the Facts or Data Underlying an Expert's Opinion

Unless the court orders otherwise, an expert may state an opinion—and give the reasons for it—without first testifying to the underlying facts or data. But the expert may be required to disclose those facts or data on cross-examination.

(As amended Mar. 2, 1987, eff. Oct. 1, 1987; Apr. 22, 1993, eff. Dec. 1, 1993; Apr. 26, 2011, eff. Dec. 1, 2011.)

Rule 706. Court-Appointed Expert Witnesses

(a) APPOINTMENT PROCESS. On a party's motion or on its own, the court may order the parties to show cause why expert witnesses should not be appointed and may ask the parties to submit nominations. The court may appoint any expert that the parties agree on and any of its own choosing. But the court may only appoint someone who consents to act.

(b) EXPERT'S ROLE. The court must inform the expert of the expert's duties. The court may do so in writing and have a copy filed with the clerk or may do so orally at a conference in which the parties have an opportunity to participate. The expert:

(1) must advise the parties of any findings the expert makes;

(2) may be deposed by any party;

(3) may be called to testify by the court or any party; and

(4) may be cross-examined by any party, including the party that called the expert.

(c) COMPENSATION. The expert is entitled to a reasonable compensation, as set by the court. The compensation is payable as follows:

(1) in a criminal case or in a civil case involving just compensation under the Fifth Amendment, from any funds that are provided by law; and

(2) in any other civil case, by the parties in the proportion and at the time that the court directs—and the compensation is then charged like other costs.

(d) DISCLOSING THE APPOINTMENT TO THE JURY. The court may authorize disclosure to the jury that the court appointed the expert.

(e) PARTIES' CHOICE OF THEIR OWN EXPERTS. This rule does not limit a party in calling its own experts.

(As amended Mar. 2, 1987, eff. Oct. 1, 1987; Apr. 26, 2011, eff. Dec. 1, 2011.)

FEDERAL RULE OF EVIDENCE 702

COMMITTEE NOTES ON RULES—2000 AMENDMENT

Rule 702 has been amended in response to *Daubert v. Merrell Dow Pharmaceuticals, Inc*., 509 U.S. 579 (1993), and to the many cases applying *Daubert*, including *Kumho Tire Co. v. Carmichael*, 119 S.Ct. 1167 (1999). In *Daubert* the Court charged trial judges with the responsibility of acting as gatekeepers to exclude unreliable expert testimony, and the Court in *Kumho* clarified that this gatekeeper function applies to all expert testimony, not just testimony based in science. *See also Kumho*, 119 S.Ct. at 1178 (citing the Committee Note to the proposed amendment to Rule 702, which had been released for public comment before the date of the *Kumho* decision). The amendment affirms the trial court's role as gatekeeper and provides some general standards that the trial court must use to assess the reliability and helpfulness of proffered expert testimony. Consistently with *Kumho*, the Rule as amended provides that all types of expert testimony present questions of admissibility for the trial court in deciding whether the evidence is reliable and helpful. Consequently, the admissibility of all expert testimony is governed by the principles of Rule 104(a). Under that Rule, the proponent has the burden of establishing that the pertinent admissibility requirements are met by a preponderance of the evidence. *See Bourjaily v. United States*, 483 U.S. 171 (1987).

Daubert set forth a non-exclusive checklist for trial courts to use in assessing the reliability of scientific expert testimony. The specific factors explicated by the *Daubert* Court are (1) whether the expert's technique or theory can be or has been tested—that is, whether the expert's theory can be challenged in some objective sense, or whether it is instead simply a subjective, conclusory approach that cannot reasonably be assessed for reliability; (2) whether the technique or theory has been subject to peer review and publication; (3) the known or potential rate of error of the technique or theory when applied; (4) the existence and maintenance of standards and controls; and (5) whether the technique or theory has been generally accepted in the scientific community. The Court in *Kumho* held that these factors might also be applicable in assessing the reliability of nonscientific expert testimony, depending upon “the particular circumstances of the particular case at issue.” 119 S.Ct. at 1175.

No attempt has been made to “codify” these specific factors. *Daubert* itself emphasized that the factors were neither exclusive nor dispositive. Other cases have recognized that not all of the specific *Daubert* factors can apply to every type of expert testimony. In addition to *Kumho*, 119 S.Ct. at 1175, *see Tyus v. Urban Search Management*, 102 F.3d 256 (7th Cir. 1996) (noting that the factors mentioned by the Court in *Daubert* do not neatly apply to expert testimony from a sociologist). *See also Kannankeril v. Terminix Int'l, Inc*., 128 F.3d 802, 809 (3d Cir. 1997) (holding that lack of peer review or publication was not dispositive where the expert's opinion was supported by “widely accepted scientific knowledge”). The standards set forth in the amendment are broad enough to require consideration of any or all of the specific *Daubert* factors where appropriate.

Courts both before and after *Daubert* have found other factors relevant in determining whether expert testimony is sufficiently reliable to be considered by the trier of fact. These factors include:

(1) Whether experts are “proposing to testify about matters growing naturally and directly out of research they have conducted independent of the litigation, or whether they have developed

their opinions expressly for purposes of testifying." *Daubert v. Merrell Dow Pharmaceuticals, Inc*., 43 F.3d 1311, 1317 (9th Cir. 1995).

(2) Whether the expert has unjustifiably extrapolated from an accepted premise to an unfounded conclusion. *See General Elec. Co. v. Joiner*, 522 U.S. 136, 146 (1997) (noting that in some cases a trial court "may conclude that there is simply too great an analytical gap between the data and the opinion proffered").

(3) Whether the expert has adequately accounted for obvious alternative explanations. *See Claar v. Burlington N.R.R*., 29 F.3d 499 (9th Cir. 1994) (testimony excluded where the expert failed to consider other obvious causes for the plaintiff's condition). *Compare Ambrosini v. Labarraque*, 101 F.3d 129 (D.C.Cir. 1996) (the possibility of some uneliminated causes presents a question of weight, so long as the most obvious causes have been considered and reasonably ruled out by the expert).

(4) Whether the expert "is being as careful as he would be in his regular professional work outside his paid litigation consulting." *Sheehan v. Daily Racing Form, Inc*., 104 F.3d 940, 942 (7th Cir. 1997). *See Kumho Tire Co. v. Carmichael*, 119 S.Ct. 1167, 1176 (1999) (*Daubert* requires the trial court to assure itself that the expert "employs in the courtroom the same level of intellectual rigor that characterizes the practice of an expert in the relevant field").

(5) Whether the field of expertise claimed by the expert is known to reach reliable results for the type of opinion the expert would give. *See Kumho Tire Co. v. Carmichael*, 119 S.Ct. 1167, 1175 (1999) (*Daubert's* general acceptance factor does not "help show that an expert's testimony is reliable where the discipline itself lacks reliability, as, for example, do theories grounded in any so-called generally accepted principles of astrology or necromancy."); *Moore v. Ashland Chemical, Inc*., 151 F.3d 269 (5th Cir. 1998) (en banc) (clinical doctor was properly precluded from testifying to the toxicological cause of the plaintiff's respiratory problem, where the opinion was not sufficiently grounded in scientific methodology); *Sterling v. Velsicol Chem. Corp*., 855 F.2d 1188 (6th Cir. 1988) (rejecting testimony based on "clinical ecology" as unfounded and unreliable).

All of these factors remain relevant to the determination of the reliability of expert testimony under the Rule as amended. Other factors may also be relevant. *See Kumho*, 119 S.Ct. 1167, 1176 ("[W]e conclude that the trial judge must have considerable leeway in deciding in a particular case how to go about determining whether particular expert testimony is reliable."). Yet no single factor is necessarily dispositive of the reliability of a particular expert's testimony. *See, e.g., Heller v. Shaw Industries, Inc*., 167 F.3d 146, 155 (3d Cir. 1999) ("not only must each stage of the expert's testimony be reliable, but each stage must be evaluated practically and flexibly without bright-line exclusionary (or inclusionary) rules."); *Daubert v. Merrell Dow Pharmaceuticals, Inc*., 43 F.3d 1311, 1317, n.5 (9th Cir. 1995) (noting that some expert disciplines "have the courtroom as a principal theatre of operations" and as to these disciplines "the fact that the expert has developed an expertise principally for purposes of litigation will obviously not be a substantial consideration.").

A review of the caselaw after *Daubert* shows that the rejection of expert testimony is the exception rather than the rule. *Daubert* did not work a "seachange over federal evidence law," and "the trial court's role as gatekeeper is not intended to serve as a replacement for the adversary system." *United States v. 14.38 Acres of Land Situated in Leflore County, Mississippi*, 80 F.3d 1074, 1078 (5th Cir. 1996). As the Court in *Daubert* stated: "Vigorous cross-

examination, presentation of contrary evidence, and careful instruction on the burden of proof are the traditional and appropriate means of attacking shaky but admissible evidence." 509 U.S. at 595. Likewise, this amendment is not intended to provide an excuse for an automatic challenge to the testimony of every expert. *See Kumho Tire Co. v. Carmichael*, 119 S.Ct. 1167, 1176 (1999) (noting that the trial judge has the discretion "both to avoid unnecessary 'reliability' proceedings in ordinary cases where the reliability of an expert's methods is properly taken for granted, and to require appropriate proceedings in the less usual or more complex cases where cause for questioning the expert's reliability arises.").

When a trial court, applying this amendment, rules that an expert's testimony is reliable, this does not necessarily mean that contradictory expert testimony is unreliable. The amendment is broad enough to permit testimony that is the product of competing principles or methods in the same field of expertise. *See, e.g., Heller v. Shaw Industries, Inc*., 167 F.3d 146, 160 (3d Cir. 1999) (expert testimony cannot be excluded simply because the expert uses one test rather than another, when both tests are accepted in the field and both reach reliable results). As the court stated in *In re Paoli R.R. Yard PCB Litigation*, 35 F.3d 717, 744 (3d Cir. 1994), proponents "do not have to demonstrate to the judge by a preponderance of the evidence that the assessments of their experts are correct, they only have to demonstrate by a preponderance of evidence that their opinions are reliable. . . . The evidentiary requirement of reliability is lower than the merits standard of correctness." *See also Daubert v. Merrell Dow Pharmaceuticals, Inc*., 43 F.3d 1311, 1318 (9th Cir. 1995) (scientific experts might be permitted to testify if they could show that the methods they used were also employed by "a recognized minority of scientists in their field."); *Ruiz-Troche v. Pepsi Cola*, 161 F.3d 77, 85 (1st Cir. 1998) (" *Daubert* neither requires nor empowers trial courts to determine which of several competing scientific theories has the best provenance.").

The Court in *Daubert* declared that the "focus, of course, must be solely on principles and methodology, not on the conclusions they generate." 509 U.S. at 595. Yet as the Court later recognized, "conclusions and methodology are not entirely distinct from one another." *General Elec. Co. v. Joiner*, 522 U.S. 136, 146 (1997). Under the amendment, as under *Daubert*, when an expert purports to apply principles and methods in accordance with professional standards, and yet reaches a conclusion that other experts in the field would not reach, the trial court may fairly suspect that the principles and methods have not been faithfully applied. *See Lust v. Merrell Dow Pharmaceuticals, Inc*., 89 F.3d 594, 598 (9th Cir. 1996). The amendment specifically provides that the trial court must scrutinize not only the principles and methods used by the expert, but also whether those principles and methods have been properly applied to the facts of the case. As the court noted in *In re Paoli R.R. Yard PCB Litig*., 35 F.3d 717, 745 (3d Cir. 1994), " *any* step that renders the analysis unreliable . . . renders the expert's testimony inadmissible. *This is true whether the step completely changes a reliable methodology or merely misapplies that methodology*."

If the expert purports to apply principles and methods to the facts of the case, it is important that this application be conducted reliably. Yet it might also be important in some cases for an expert to educate the factfinder about general principles, without ever attempting to apply these principles to the specific facts of the case. For example, experts might instruct the factfinder on the principles of thermodynamics, or bloodclotting, or on how financial markets respond to corporate reports, without ever knowing about or trying to tie their testimony into the facts of the case. The amendment does not alter the venerable practice of using expert testimony to educate the factfinder on general principles. For this kind of generalized testimony, Rule 702 simply requires that: (1) the expert be qualified; (2) the testimony address a subject matter on

which the factfinder can be assisted by an expert; (3) the testimony be reliable; and (4) the testimony "fit" the facts of the case.

As stated earlier, the amendment does not distinguish between scientific and other forms of expert testimony. The trial court's gatekeeping function applies to testimony by any expert. *See Kumho Tire Co. v. Carmichael*, 119 S.Ct. 1167, 1171 (1999) ("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."). While the relevant factors for determining reliability will vary from expertise to expertise, the amendment rejects the premise that an expert's testimony should be treated more permissively simply because it is outside the realm of science. An opinion from an expert who is not a scientist should receive the same degree of scrutiny for reliability as an opinion from an expert who purports to be a scientist. *See Watkins v. Telsmith, Inc*., 121 F.3d 984, 991 (5th Cir. 1997) ("[I]t seems exactly backwards that experts who purport to rely on general engineering principles and practical experience might escape screening by the district court simply by stating that their conclusions were not reached by any particular method or technique."). Some types of expert testimony will be more objectively verifiable, and subject to the expectations of falsifiability, peer review, and publication, than others. Some types of expert testimony will not rely on anything like a scientific method, and so will have to be evaluated by reference to other standard principles attendant to the particular area of expertise. The trial judge in all cases of proffered expert testimony must find that it is properly grounded, well-reasoned, and not speculative before it can be admitted. The expert's testimony must be grounded in an accepted body of learning or experience in the expert's field, and the expert must explain how the conclusion is so grounded. *See, e.g*., American College of Trial Lawyers, *Standards and Procedures for Determining the Admissibility of Expert Testimony after Daubert*, 157 F.R.D. 571, 579 (1994) ("[W]hether the testimony concerns economic principles, accounting standards, property valuation or other non-scientific subjects, it should be evaluated by reference to the 'knowledge and experience' of that particular field.").

The amendment requires that the testimony must be the product of reliable principles and methods that are reliably applied to the facts of the case. While the terms "principles" and "methods" may convey a certain impression when applied to scientific knowledge, they remain relevant when applied to testimony based on technical or other specialized knowledge. For example, when a law enforcement agent testifies regarding the use of code words in a drug transaction, the principle used by the agent is that participants in such transactions regularly use code words to conceal the nature of their activities. The method used by the agent is the application of extensive experience to analyze the meaning of the conversations. So long as the principles and methods are reliable and applied reliably to the facts of the case, this type of testimony should be admitted.

Nothing in this amendment is intended to suggest that experience alone—or experience in conjunction with other knowledge, skill, training or education—may not provide a sufficient foundation for expert testimony. To the contrary, the text of Rule 702 expressly contemplates that an expert may be qualified on the basis of experience. In certain fields, experience is the predominant, if not sole, basis for a great deal of reliable expert testimony. *See, e.g., United States v. Jones*, 107 F.3d 1147 (6th Cir. 1997) (no abuse of discretion in admitting the testimony of a handwriting examiner who had years of practical experience and extensive training, and who explained his methodology in detail); *Tassin v. Sears Roebuck*, 946 F.Supp. 1241, 1248 (M.D.La. 1996) (design engineer's testimony can be admissible when the expert's opinions "are based on facts, a reasonable investigation, and traditional technical/mechanical expertise, and

he provides a reasonable link between the information and procedures he uses and the conclusions he reaches"). *See also Kumho Tire Co. v. Carmichael*, 119 S.Ct. 1167, 1178 (1999) (stating that "no one denies that an expert might draw a conclusion from a set of observations based on extensive and specialized experience.").

If the witness is relying solely or primarily on experience, then the witness must explain how that experience leads to the conclusion reached, why that experience is a sufficient basis for the opinion, and how that experience is reliably applied to the facts. The trial court's gatekeeping function requires more than simply "taking the expert's word for it." *See Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 43 F.3d 1311, 1319 (9th Cir. 1995) ("We've been presented with only the experts' qualifications, their conclusions and their assurances of reliability. Under *Daubert*, that's not enough."). The more subjective and controversial the expert's inquiry, the more likely the testimony should be excluded as unreliable. *See O'Conner v. Commonwealth Edison Co.*, 13 F.3d 1090 (7th Cir. 1994) (expert testimony based on a completely subjective methodology held properly excluded). *See also Kumho Tire Co. v. Carmichael*, 119 S.Ct. 1167, 1176 (1999) ("[I]t will at times be useful to ask even of a witness whose expertise is based purely on experience, say, a perfume tester able to distinguish among 140 odors at a sniff, whether his preparation is of a kind that others in the field would recognize as acceptable.").

Subpart (1) of Rule 702 calls for a quantitative rather than qualitative analysis. The amendment requires that expert testimony be based on sufficient underlying "facts or data." The term "data" is intended to encompass the reliable opinions of other experts. See the original Advisory Committee Note to Rule 703. The language "facts or data" is broad enough to allow an expert to rely on hypothetical facts that are supported by the evidence. *Id.*

When facts are in dispute, experts sometimes reach different conclusions based on competing versions of the facts. The emphasis in the amendment on "sufficient facts or data" is not intended to authorize a trial court to exclude an expert's testimony on the ground that the court believes one version of the facts and not the other.

There has been some confusion over the relationship between Rules 702 and 703. The amendment makes clear that the sufficiency of the basis of an expert's testimony is to be decided under Rule 702. Rule 702 sets forth the overarching requirement of reliability, and an analysis of the sufficiency of the expert's basis cannot be divorced from the ultimate reliability of the expert's opinion. In contrast, the "reasonable reliance" requirement of Rule 703 is a relatively narrow inquiry. When an expert relies on inadmissible information, Rule 703 requires the trial court to determine whether that information is of a type reasonably relied on by other experts in the field. If so, the expert can rely on the information in reaching an opinion. However, the question whether the expert is relying on a *sufficient* basis of information—whether admissible information or not—is governed by the requirements of Rule 702.

The amendment makes no attempt to set forth procedural requirements for exercising the trial court's gatekeeping function over expert testimony. *See* Daniel J. Capra, *The Daubert Puzzle*, 38 Ga.L.Rev. 699, 766 (1998) ("Trial courts should be allowed substantial discretion in dealing with *Daubert* questions; any attempt to codify procedures will likely give rise to unnecessary changes in practice and create difficult questions for appellate review."). Courts have shown considerable ingenuity and flexibility in considering challenges to expert testimony under *Daubert*, and it is contemplated that this will continue under the amended Rule. *See, e.g., Cortes-Irizarry v. Corporacion Insular*, 111 F.3d 184 (1st Cir. 1997) (discussing the application of *Daubert* in ruling on a motion for summary judgment); *In re Paoli R.R. Yard PCB Litig.*, 35

F.3d 717, 736, 739 (3d Cir. 1994) (discussing the use of *in limine* hearings); *Claar v. Burlington N.R.R.*, 29 F.3d 499, 502–05 (9th Cir. 1994) (discussing the trial court's technique of ordering experts to submit serial affidavits explaining the reasoning and methods underlying their conclusions).

The amendment continues the practice of the original Rule in referring to a qualified witness as an "expert." This was done to provide continuity and to minimize change. The use of the term "expert" in the Rule does not, however, mean that a jury should actually be informed that a qualified witness is testifying as an "expert." Indeed, there is much to be said for a practice that prohibits the use of the term "expert" by both the parties and the court at trial. Such a practice "ensures that trial courts do not inadvertently put their stamp of authority" on a witness's opinion, and protects against the jury's being "overwhelmed by the so-called 'experts'." Hon. Charles Richey, *Proposals to Eliminate the Prejudicial Effect of the Use of the Word "Expert" Under the Federal Rules of Evidence in Criminal and Civil Jury Trials*, 154 F.R.D. 537, 559 (1994) (setting forth limiting instructions and a standing order employed to prohibit the use of the term "expert" in jury trials).

ARTICLE VII. OPINIONS AND EXPERT TESTIMONY

Rule 701. Opinion Testimony by Lay Witnesses.

If a witness is not testifying as an expert, testimony in the form of an opinion is limited to one that is:

(a) rationally based on the witness's perception;

(b) helpful to clearly understanding the witness's testimony or to determining a fact in issue; and

(c) not based on scientific, technical, or other specialized knowledge within the scope of Rule 702.

Comment

This rule is identical to F.R.E. 701.

On January 17, 2013, the Rules of Evidence were rescinded and replaced. *See* Pa.R.E. 101, Comment. Within Article VII, the term ''inference'' has been eliminated when used in conjunction with ''opinion.'' The term ''inference'' is subsumed by the broader term ''opinion'' and Pennsylvania case law has not made a substantive decision on the basis of any distinction between an opinion and an inference. No change in the current practice was intended with the elimination of this term.

Official Note: Adopted May 8, 1998, effective October 1, 1998; amended November 2, 2001, effective January 2, 2002; rescinded and replaced January 17, 2013, effective March 18, 2013.

Committee Explanatory Reports:

Final Report explaining the November 2, 2001, amendments published with the Court's Order at 31 Pa.B. 6384 (November 24, 2001).

Final Report explaining the January 17, 2013 rescission and replacement published with the Court's Order at 43 Pa.B. 651 (February 2, 2013).

Source

The provisions of this Rule 701 amended November 2, 2001, effective January 1, 2002, 31 Pa.B. 6381; rescinded and replaced January 17, 2013, effective in sixty days, 43 Pa.B. 620. Immediately preceding text appears at serial page (303515).

Rule 702. Testimony by Expert Witnesses.

A witness who is qualified as an expert by knowledge, skill, experience, training, or education may testify in the form of an opinion or otherwise if:

(a) the expert's scientific, technical, or other specialized knowledge is beyond that possessed by the average layperson;

(b) the expert's scientific, technical, or other specialized knowledge will help the trier of fact to understand the evidence or to determine a fact in issue; and

(c) the expert's methodology is generally accepted in the relevant field.

Comment

Pa.R.E. 702(a) and (b) differ from F.R.E. 702 in that Pa.R.E. 702(a) and (b) impose the requirement that the expert's scientific, technical, or other specialized knowledge is admissible only if it is beyond that possessed by the average layperson. This is consistent with prior Pennsylvania law. *See Commonwealth v. O'Searo*, 466 Pa. 224, 229, 352 A.2d 30, 32 (1976).

Pa.R.E. 702(c) differs from F.R.E. 702 in that it reflects Pennsylvania's adoption of the standard in *Frye v. United States*, 293 F. 1013 (D.C. Cir. 1923). The rule applies the ''general acceptance'' test for the admissibility of scientific, technical, or other specialized knowledge testimony. This is consistent with prior Pennsylvania law. *See Grady v. Frito-Lay, Inc.*, 576 Pa. 546, 839 A.2d 1038 (2003). The rule rejects the federal test derived from *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 509 U.S. 579 (1993).

Pa.R.E. 702 does not change the Pennsylvania rule for qualifying a witness to testify as an expert. In *Miller v. Brass Rail Tavern, Inc.*, 541 Pa. 474, 480-81, 664 A.2d 525, 528 (1995), the Supreme Court stated:

> The test to be applied when qualifying a witness to testify as an expert witness is whether the witness has any reasonable pretension to specialized knowledge on the subject under investigation. If he does, he may testify and the weight to be given to such testimony is for the trier of fact to determine.

Pa.R.E. 702 does not change the requirement that an expert's opinion must be expressed with reasonable certainty. *See McMahon v. Young*, 442 Pa. 484, 276 A.2d 534 (1971).

Pa.R.E. 702 states that an expert may testify in the form of an ''opinion or otherwise.'' Much of the literature assumes that experts testify only in the form of an opinion. The language ''or otherwise'' reflects the fact that experts frequently are called upon to educate the trier of fact about the scientific or technical principles relevant to the case.

Official Note: Adopted May 8, 1998, effective October 1, 1998; Comment revised April 1, 2004, effective May 10, 2004; rescinded and replaced January 17, 2013, effective March 18, 2013.

Committee Explanatory Reports:

Final Report explaining the January 17, 2013 rescission and replacement published with the Court's Order at 43 Pa.B. 651 (February 2, 2013).

Source

The provisions of this Rule 702 amended April 1, 2004, effective May 10, 2004, 34 Pa.B. 2065; rescinded and replaced January 17, 2013, effective in sixty days, 43 Pa.B. 620. Immediately preceeding text appears at serial pages (303515) to (303516).

Rule 703. Bases of an Expert's Opinion Testimony.

An expert may base an opinion on facts or data in the case that the expert has been made aware of or personally observed. If experts in the particular field would reasonably rely on those kinds of facts or data in forming an opinion on the subject, they need not be admissible for the opinion to be admitted.

Comment

This rule is identical to the first two sentences of F.R.E. 703. It does not include the third sentence of the Federal Rule that provides that the facts and data that are the bases for the expert's opinion are not admissible unless their probative value substantially outweighs their prejudicial effect. This is inconsistent with Pennsylvania law which requires that facts and data that are the bases for the expert's opinion must be disclosed to the trier of fact. *See* Pa.R.E. 705.

Pa.R.E. 703 requires that the facts or data upon which an expert witness bases an opinion be "of a type reasonably relied upon by experts in the particular field. . . ." Whether the facts or data satisfy this requirement is a preliminary question to be determined by the trial court under Pa.R.E. 104(a). If an expert witness relies on novel scientific evidence, Pa.R.C.P. No. 207.1 sets forth the procedure for objecting, by pretrial motion, on the ground that the testimony is inadmissible under Pa.R.E. 702, or Pa.R.E. 703, or both.

When an expert testifies about the underlying facts and data that support the expert's opinion and the evidence would be otherwise inadmissible, the trial judge upon request must, or on the judge's own initiative may, instruct the jury to consider the facts and data only to explain the basis for the expert's opinion, and not as substantive evidence.

An expert witness cannot be a mere conduit for the opinion of another. An expert witness may not relate the opinion of a non-testifying expert unless the witness has reasonably relied upon it in forming the witness's own opinion. *See, e.g.*, *Foster v. McKeesport Hospital*, 260 Pa. Super. 485, 394 A.2d 1031 (1978); *Allen v. Kaplan*, 439 Pa. Super. 263, 653 A.2d 1249 (1995).

Official Note: Adopted May 8, 1998, effective October 1, 1998; Comment revised September 11, 2003, effective September 30, 2003; rescinded and replaced January 17, 2013, effective March 18, 2013.

Committee Explanatory Reports:

Final Report explaining the September 11, 2003 revision of the Comment published with the Court's Order at 33 Pa.B. 4784 (September 27, 2003).

Final Report explaining the January 17, 2013 rescission and replacement published with the Court's Order at 43 Pa.B. 651 (February 2, 2013).

Source

The provisions of this Rule 703 amended September 11, 2003, effective September 30, 2003, 33 Pa.B. 4784; rescinded and replaced January 17, 2013, effective in sixty days, 43 Pa.B. 620. Immediately preceding text appears at serial pages (303516) and (299643).

Rule 704. Opinion on an Ultimate Issue.

An opinion is not objectionable just because it embraces an ultimate issue.

Comment

Pa.R.E. 704 is identical to F.R.E. 704(a).

F.R.E. 704(b) is not adopted. The Federal Rule prohibits an expert witness in a criminal case from stating an opinion about whether the defendant did or did not have a mental state or condition that constitutes an element of the crime charged or a defense. This is inconsistent with Pennsylvania law. *Commonwealth v. Walzack*, 468 Pa. 210, 360 A.2d 914 (1976).

Official Note: Adopted May 8, 1998, effective October 1, 1998; rescinded and replaced January 17, 2013, effective March 18, 2013.

Committee Explanatory Reports:

Final Report explaining the January 17, 2013 rescission and replacement published with the Court's Order at 43 Pa.B. 651 (February 2, 2013).

Source

The provisions of this Rule 704 rescinded and replaced January 17, 2013, effective in sixty days, 43 Pa.B. 620. Immediately preceding text appears at serial pages (299643) to (299644).

Rule 705. Disclosing the Facts or Data Underlying an Expert's Opinion.

If an expert states an opinion the expert must state the facts or data on which the opinion is based.

Comment

The text and substance of Pa.R.E. 705 differ significantly from F.R.E. 705. The Federal Rule generally does not require an expert witness to disclose the facts upon which an opinion is based prior to expressing the opinion. Instead, the cross-examiner bears the burden of probing the basis of the opinion. Pennsylvania does not follow the Federal Rule. *See Kozak v. Struth*, 515 Pa. 554, 560, 531 A.2d 420, 423 (1987) (declining to adopt F.R.E. 705, the Court reasoned that "requiring the proponent of an expert opinion to clarify for the jury the assumptions upon which the opinion is based avoids planting in the juror's mind a general statement likely to remain with him in the jury room when the disputed details are lost.") Relying on cross-examination to illuminate the underlying assumption, as F.R.E. 705 does, may further confuse jurors already struggling to follow complex testimony. *Id.*

Accordingly, *Kozak* requires disclosure of the facts used by the expert in forming an opinion. The disclosure can be accomplished in several ways. One way is to ask the expert to assume the truth of testimony the expert has heard or read. *Kroeger Co. v. W.C.A.B.*, 101 Pa. Cmwlth. 629, 516 A.2d 1335 (1986); *Tobash v. Jones*, 419 Pa. 205, 213 A.2d 588 (1965). Another option is to pose a hypothetical question to the expert. *Dietrich v. J.I. Case Co.*, 390 Pa. Super. 475, 568 A.2d 1272 (1990); *Hussey v. May Department Stores, Inc.*, 238 Pa. Super. 431, 357 A.2d 635 (1976).

When an expert testifies about the underlying facts and data that support the expert's opinion and the evidence would be otherwise inadmissible, the trial judge upon request must, or on the judge's own initiative may, instruct the jury to consider the facts and data only to explain the basis for the expert's opinion, and not as substantive evidence.

Official Note: Adopted May 8, 1998, effective October 1, 1998; rescinded and replaced January 17, 2013, effective March 18, 2013.

Committee Explanatory Reports:

Final Report explaining the January 17, 2013 rescission and replacement published with the Court's Order at 43 Pa.B. 651 (February 2, 2013).

Source

The provisions of this Rule 705 rescinded and replaced January 17, 2013, effective in sixty days, 43 Pa.B. 620. Immediately preceding text appears at serial page (299644).

Rule 706. Court-Appointed Expert Witnesses.

Where the court has appointed an expert witness, the witness appointed must advise the parties of the witness's findings, if any. The witness may be called to

testify by the court or any party. The witness shall be subject to cross-examination by any party, including a party calling the witness. In civil cases, the witness's deposition may be taken by any party.

Comment

Pa.R.E. 706 differs from F.R.E. 706. Unlike the Federal Rule, Pa.R.E. 706 does not affect the scope of the trial court's power to appoint experts. Pa.R.E. 706 provides only the procedures for obtaining the testimony of experts after the court has appointed them.

In *Commonwealth v. Correa*, 437 Pa. Super. 1, 648 A.2d 1199 (1994), abrogated on other grounds by *Commonwealth v. Weston*, 561 Pa. 199, 749 A.2d 458 (2000), the Superior Court held that the trial court had inherent power to appoint an expert. 23 Pa.C.S. § 5104 provides for the appointment of experts to conduct blood tests in paternity proceedings.

See also Pa.R.E. 614 (Court's Calling or Examining a Witness).

Official Note: Adopted May 8, 1998, effective October 1, 1998; rescinded and replaced January 17, 2013, effective March 18, 2013.

Committee Explanatory Reports:

Final Report explaining the January 17, 2013 rescission and replacement published with the Court's Order at 43 Pa.B. 651 (February 2, 2013).

Source

The provisions of this Rule 706 rescinded and replaced January 17, 2013, effective in sixty days, 43 Pa.B. 620. Immediately preceding text appears at serial pages (299644) to (299645).

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