

FILED
Court of Appeals
Division III
State of Washington
7/30/2018 8:00 AM

NO. 35035-5-III

COURT OF APPEALS

STATE OF WASHINGTON
DIVISION III

STATE OF WASHINGTON,

Plaintiff/Respondent,

V.

ROY HOWARD MURRY,

Defendant/Appellant.

BRIEF OF APPELLANT

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ASSIGNMENTS OF ERROR

1. A. The State failed to prove, beyond a reasonable doubt, each and every element of attempted first degree murder as charged in Count IV of the Information. (CP 1)

B. When the State failed to include the essential element of pre-meditation in the charging document, Roy Edward Murry was denied his constitutional rights under the Sixth Amendment to the United States Constitution and Const. art. I, § 22 because he was not fully informed of the nature of the charge against him.

2. There was no direct evidence that Mr. Murry committed the charged offenses, and the circumstantial evidence presented was insufficient to prove, beyond a reasonable doubt, that he did so.

3. The admission of the following evidence unfairly prejudiced Mr. Murry and denied him due process, including a fair and impartial trial:

- (a) Character evidence;
- (b) Aliases;
- (c) Various songs downloaded from his computer;

(d) Supposed hit list.

4. The husband and wife privilege, RCW 5.60.060(1), was violated by Amanda Constable's (f/k/a Amanda Murry) testimony;

5. The trial court's determination that expert testimony would be helpful to the jury's understanding of scientific evidence (Conclusions of Law E, J, and K; CP 1142; CP 1143; Appendix "A") following a *Frye*¹ hearing, was error which was compounded at trial by the expert witnesses conclusions.

6. Defense counsel did not raise an issue as to Mr. Murry's competency.

7. Cumulative error deprived Mr. Murry of a fair and impartial trial under the Fourteenth Amendment to the United States Constitution and Const. art. I, § 22.

ISSUES RELATING TO ASSIGNMENTS OF ERROR

1. A. Did the State prove, beyond a reasonable doubt, that Mr. Murry took a substantial step toward the commission of first degree murder of Amanda Murry (now Amanda Constable²)?

¹ *Frye v. United States*, 54 App. D.C. 46, 293 F. 1013 (1923)

² Referred to as Amanda Constable in the rest of this brief

B. Is premeditation an essential element of attempted first degree murder, and, if so, does its omission from the charging document require reversal of Mr. Murry's conviction because it violates the "essential elements" rule?

2. Was the circumstantial evidence presented at trial sufficient to prove, beyond a reasonable doubt, that Mr. Murry was guilty of the crimes of first degree murder, attempted first degree murder and first degree arson?

3. Did the trial court improperly admit character evidence in contravention of ER 404(a)(1) and ER 405 to Mr. Murry's detriment?

4. Did the trial court improperly admit testimony from Amanda Constable concerning aliases used by Mr. Murry?

5. Did the admission of songs downloaded from Mr. Murry's computer prejudicially impact his constitutional right to a fair and impartial trial?

6. Did Amanda Constable's testimony concerning an alleged hit list prejudice Mr. Murry and also violate the husband and wife privilege?

7. Was Amanda Constable's testimony as to text messages between herself and Mr. Murry, while they were separated but still married, in violation of RCW 5.60.060(1)?

8. Did the trial court err by allowing expert testimony, following a *Frye* hearing, that was more confusing and speculative than helpful to a jury?

9. Should defense counsel have raised the issue of Mr. Murry's competency?

10. Did cumulative error deprive Mr. Murry of a fair trial?

STATEMENT OF THE CASE

Terry Canfield, Lisa Canfield and John Constable died of multiple gunshot wounds on Memorial Day 2015. (Kerbs³ RP 3987, ll. 13-17; RP 3989, ll. 16-20; RP 3991, ll. 3-5; ll. 20-22; RP 3995, l. 25 to RP 3996, l. 1; RP 4007, ll. 22-25; RP 4014, ll. 21-22; RP 4016, ll. 14-20; RP 4025, ll. 20-24; RP 4027, ll. 7-13; RP 4030, l. 18 to RP 4031, l. 1; RP 4032, ll. 21-25; RP 4037, ll. 20-25; RP 4050, ll. 1-8; ll. 10-14; RP 4057, ll. 4-14; ll. 17-25; RP 4060, ll. 1-16; RP 4061, ll. 18-19; RP 4067, ll. 19-22; RP 4075, ll. 7-8; RP 4078, ll. 17-24)

The Canfield house and barn were set on fire following the shootings. Terry Canfield's body was found mostly incinerated inside the barn. Lisa Canfield and John Constable's bodies were found inside the house.

³ Unless otherwise noted all RP references are to the Kerbs RP

(Hicks RP 413, ll. 15-21; RP 423, ll. 6-25; RP 426, l. 18 to RP 427, l. 13; RP 474, ll. 12-14; Kerbs RP 1502, ll. 1-2; RP 1721, l. 24 to RP 1722, l. 3)

Amanda Constable, Lisa's daughter, was working at Sacred Heart Hospital. She had elected to work an extra shift or she would have been home when the shootings occurred. (RP 2383, ll. 10-15; RP 2388, ll. 1-12; RP 2393, ll. 23-25; RP 2691, ll. 15-20; RP 2782, ll. 5-9; RP 2795, ll. 10-18)

The fire was reported to 9-1-1 by a neighbor at 2:00 a.m. Other neighbors later told of hearing gunshots between midnight and 1:00 a.m. (Hicks RP 324, ll. 20-21; RP 325, ll. 3-8; RP 326, ll. 13-22; RP 327, l. 13 to RP 328, l. 25; RP 329, ll. 1-21; RP 355, ll. 1-11; RP 356, l. 16 to RP 357, l. 4; RP 361, l. 25 to RP 362, l. 5; RP 367, ll. 12-17; RP 368, ll. 3-14)

Fire department personnel, law enforcement and arson investigators, along with K-9's, conducted extensive searches at the scene, in the surrounding area following a security breach, and pursuant to search warrants. (Hicks RP 493, ll. 22-23; RP 497, l. 13 to RP 498, l. 5; Kerbs RP 1499, ll. 4-6; RP 1502, ll. 8-11; RP 1684, l. 24 to RP 1685, l. 17; RP 1762, ll. 3-16; RP 1868, ll. 13-18; RP 1877, ll. 16-21; RP 1923, ll. 12-25; RP 1924, ll. 3-17; RP 2011, ll. 5-16; RP 2033, l. 24 to RP 2034, l. 7; RP 2160, ll. 12-17; RP 2164, l. 25 to RP 2165, l. 2; RP 2170, ll. 2-9; RP 2189, ll. 17-20; RP 2197, l. 2 to RP 2198, l. 5; RP 2209, ll. 6-8; RP 2211, ll. 18-24; RP 2217, ll. 14-20; RP 2220, ll. 15-16)

Roy Edward Murry, Lisa Canfield's son-in-law, soon became the prime suspect. Mr. Murry's military background was of particular interest to the state. Mr. Murry was wounded while on duty in Iraq. He received a bronze star and a purple heart for his actions in that encounter. (RP 3137, l. 22 to RP 3138, l. 4; RP 3139, ll. 9-16; RP 3145, ll. 18-20; RP 3147, ll. 3-5; RP 3163, ll. 2-10; RP 3164, l. 21 to RP 3165, l. 2; RP 3360, ll. 1-12)

Search warrants were executed and served at Mr. Murry's Lewiston apartment, his storage unit in Pullman, at his parent's residence in Walla Walla and on his car. (RP 1839, ll. 6-25; RP 2224, ll. 6-8; RP 2360, ll. 1-9; RP 2362, ll. 5-25; RP 2411, ll. 19-22; RP 2433, l. 19 to RP 2434, l. 6; RP 2481, ll. 3-6; RP 2518, ll. 1-3; ll. 17-24; RP 2568, ll. 1-5)

The search warrants resulted in the seizure of various weapons, vast amounts of ammunition, military gear, medical supplies, Trioxane, and a vial of Accudure. (RP 2411, ll. 19-22; RP 2415, l. 2 to RP 2424, l. 18; RP 2426, l. 2 to RP 2427, l. 13; RP 2433, l. 19 to RP 2459, l. 25; RP 2481, l. 3 to RP 2482, l. 25; RP 2520, ll. 7-16; RP 2529, l. 1 to RP 2555, l. 7; RP 2569, l. 2 to RP 2618, l. 10; RP 2621, l. 5 to RP 2636, l. 11; Appendix B"; Appendix "C")

Spent .22 casings were found at the scene. They were later sent to the Washington State Patrol Crime Lab (WSPCL). Bullets recovered at the autopsies were also provided to WSPCL. WSPCL also received a DNA

swab from Mr. Murry. Carpet samples from his car and apartment, along with carpet samples from the scene were examined for blood and/or accelerants. (RP 1716, ll. 14-21; RP 1719, ll. 17-18; RP 1720, l. 19 to RP 1721, l. 7; RP 1721, ll. 20-23; RP 1723, l. 10 to RP 1724, l. 4; RP 1727, l. 25 to RP 1728, l. 12; RP 1754, l. 18 to RP 1755, l. 18; RP 3657, l. 19 to RP 3658, l. 2; RP 3688, l. 25 to RP 3689, l. 3)

WSPCL analysts were unable to establish with any certainty that Mr. Murry was involved with either the murders or the arson. (RP 2520, ll. 24-25; RP 3417, ll. 3-5; ll. 9-10; RP 3426, l. 20 to RP 3437, l. 15; RP 3445, ll. 2-3; RP 3541, ll. 12-15; RP 3544, ll. 1-15; RP 3588, l. 24 to RP 3589, l. 4; RP 3591, ll. 22-25; RP 3592, ll. 1-23; RP 3592, l. 25 to RP 3593, l. 20; RP 3657, l. 19 to RP 3658, l. 2; RP 3661, ll. 9-21; RP 3701, ll. 11-19; RP 3703, l. 20 to RP 3704, l. 10; RP 3709, l. 24 to RP 3710, l. 19; RP 3713, ll. 7-16; RP 3714, ll. 9-20; RP 3715, ll. 9-18; RP 3716, ll. 1-10; RP 3717, l. 13 to RP 3718, l. 1; RP 3719, ll. 2-14; RP 3752, ll. 19-25; RP 3757, ll. 7-12; RP 3759, ll. 13-24)

Using a scanning electron microscope (SEM), William Schneck, a materials analyst with WSPCL, located an anomalous residue on one of the cartridge cases recovered from the scene of the shootings. Due to the fact that the SEM was unable to magnify the residue to a sufficient degree for identification he contacted MVA Scientific Consultants for use of their

transmission electron microscope (TEM). (RP 304, ll. 19-21; RP 305, ll. 2-4; RP 312, l. 22 to RP 313, l. 1; RP 318, l. 14 to RP 320, l. 5; RP 322, ll. 1-22; Appendix “D”)

Richard Brown, of MVA, a senior forensic microscopist, determined that the anomalous residue consisted of nanoparticles containing magnesium silicate and aluminum. (RP 346, ll. 8-9; RP 347, ll. 3-6; l. 19; RP 364, l 20 to RP 365, l. 1)

Both Mr. Schneck and Mr. Brown also examined a sample of Accudure. They determined that Accudure, a proprietary compound developed by Pavlo Rudenko, contained magnesium silicate. Only one cartridge case with one particle was found at the scene. Mr. Schneck’s testing was inconclusive as to the presence of Accudure on the fired cartridges recovered from the scene. However, prior to sending the cartridges to MVA a series of test firings was performed using Accudure. There were also test firings without the use of Accudure. Test fired cartridges showed similar residue with a reduced presence as to each subsequent cartridge. (RP 311, ll. 23-24; RP 314, ll. 2-3; RP 318, l. 4 to RP 320, l. 5; RP 320, l. 23 to RP 321, l. 16; RP 323, ll. 17-18; RP 325, l. 14 to RP 326, l. 16; RP 340, ll. 16-25; Appendices “E” and “F”)

The trial court conducted a *Frye* hearing on November 4, 2016. Both Mr. Schneck and Mr. Brown testified at the *Frye* hearing.

Mr. Schneck had never seen this type of particle before. His use of the term “inclusive” means “I can’t render an opinion as if that particle came or did not come from a particular material.” (RP 342, ll. 13-18)

Mr. Brown indicated that this was the first time that he knew of when the TEM was used in a criminal case. He himself had never done any testing in a criminal case. (RP 355, ll. 11-17; RP 381, ll. 3-7)

Mr. Brown described what MVA does when a material is submitted to it for analysis. He referred to it as a forensic environmental analysis. “We have particulate we collect, we identify it, and we analyze it and then we interpret what the meaning of our analyses are as they pertain to law and science matters.” (RP 381, ll.17-23)

A comparability analysis was then done in connection with the Accudure sample. Mr. Brown’s testing indicated that the particles had a similar elemental composition. However, the testing showed lead particles adhering to and associated with the magnesium silicate particles. None of the crime scene casings had lead particles on them. He could not explain that difference. (RP 391, ll. 17-25; RP 392, l. 8 to RP 393, l. 16)

Neither Mr. Schneck nor Mr. Brown tested any other gun lubricants which are sold to the public. They did not know the elemental composition of those gun lubricants. The most they could say was that the nanoparticles from the Accudure vial were “consistent with” the nanoparticles found on

the cartridge. Nevertheless, “consistent with” is not the same as “conclusive.” (RP 394, ll. 6-16; RP 406, l. 2 to RP 407, l. 2)

The trial court determined that the TEM analysis met the *Frye* standard and entered Findings of Fact and Conclusions of Law in support of its determination. (RP 435, l. 19 to RP 440, l. 25; CP 1142)

An Information was filed on June 29, 2015 charging Mr. Murry with three (3) counts of premeditated first degree murder. A firearm enhancement was added to each count. He was also charged with one (1) count of attempted first degree murder and one (1) count of first degree arson. (CP 1)

Multiple continuances were granted due to the complexity of the case, the need for scientific testing of various evidentiary items and witness interviews. (CP 30; CP 74; CP 76; CP 120; CP 410; CP 436)

A CrR 3.5 hearing was conducted to determine the admissibility of statements made by Mr. Murry during various police interviews. The trial court determined that the statements were admissible on the basis that Mr. Murry was not in custody. Findings of Fact and Conclusions of Law were entered on November 7, ,2016. (CP 185; CP 390; CP 413; CP 1125; CP 1130)

In addition to the *Frye* hearing and the CrR 3.5 hearing, multiple other motions were argued concerning the admissibility of various items of

evidence. These included songs that had been found on Mr. Murry's Facebook page; Mr. Murry's gun collection; and text messages on Mr. Murry's and Amanda Constable's cellphones. (RP 223, l. 4 to RP 225, l. 8; RP 241, ll. 7-17; RP 243, l. 11 to RP 244, l. 19; RP 242, ll. 12-16; ll. 19-21; RP 251, l. 12 to RP 253, l. 14; RP 257, l. 21 to RP 258, l.13; RP 262, l. 9 to RP 263, l. 7; RP 435, l. 19 to RP 440, l. 25; CP 372; CP 793; CP 925)

At the end of the State's case defense counsel moved for dismissal of Count IV (attempted first degree murder) which was denied. A jury found Mr. Murry guilty of all of the charged offenses. Special verdicts were entered that he was armed with a firearm and that there were multiple deaths. (RP 4098, l. 13 to RP 4105, l. 18; CP 1204; CP 1205; CP 1206; CP 1207; CP 1208; CP 1209; CP 1210; CP 1211; CP 1212; CP 1213; CP 1214)

Judgment and Sentence was entered on January 12, 2017. Counts I, II, III and IV were ordered to run consecutively. Count V was run concurrent. (CP 2575)

Mr. Murry filed his Notice of Appeal on January 19, 2017. (CP 2593)

SUMMARY OF ARGUMENT

Mr. Murry's case is replete with a plethora of evidentiary errors which deprived him of his constitutional right to a fair and impartial trial.

Mr. Murry did not testify at trial. He did not call any witnesses. Yet the State proceeded to introduce character evidence which was highly prejudicial to him. He was painted as an unstable, antisocial, vindictive and dangerous individual who because of his military background, alleged use of aliases, choice in music videos and maintaining some type of unidentified, unavailable imaginary hit list had to have committed the offenses.

The lack of any direct evidence that he attempted to murder Amanda Constable, her testimony in violation of the marital privilege and the charging deficiency in Count IV of the Information further contributed to the unfairness of his trial.

In addition, the trial court's *Frye* ruling allowing speculative, inconclusive expert opinions placed an unfounded imprimatur on that testimony.

The question of Mr. Murry's competency, as became apparent during the testimony of the State's witnesses, sufficed to hammer home Mr. Murry's likelihood of having committed the charged offenses.

ARGUMENT

I. ATTEMPTED FIRST DEGREE MURDER

Count IV of the Information charges Mr. Murry with the attempted first degree murder of his wife, Amanda Constable. It states:

COUNT IV:

Attempted First Degree Murder, committed as follows: That the defendant, **ROY H. MURRY**, in the State of Washington, on or about May 26, 2015, with intent to commit the crime of **FIRST DEGREE MURDER** as set out in RCW 9A.32.030, committed an act which was a substantial step toward that crime, by attempting to cause the death of AMANDA MURRY, a human being.

Mr. Murry challenges the sufficiency of the evidence concerning this count. As set out in *State v. Green*, 94 Wn.2d 216, 221, 616 P.2d 628 (1980):

“... [T]he relevant question is whether, after viewing the evidence in the light most favorable to the prosecution, *any rational trier of fact* could have found the essential elements of the crime *beyond a reasonable doubt*.” *Jackson v. Virginia*, 443 U.S. 307, 319, 99 S. Ct. 2781, 61 L. Ed.2d 560 (1979).

Mr. Murry asserts that more than a reasonable doubt exists as to whether or not any attempt was made upon the life of Amanda Constable.

RCW 9A.28.020(1) states: “A person is guilty of an attempt to commit a crime if, with intent to commit a specific crime, he or she does any act which is a substantial step toward the commission of that crime.”

“Attempted first degree murder ... requires the specific intent to cause the death of another person.” *State v. Latham*, 3 Wn. App. 2d 468, 481 (2018)

The State's proof in connection with an attempt is minimal. The State established that Mr. Murry knew Ms. Constable's work schedule. (RP 2782, ll. 5-9; RP 2783, ll. 19-25)

According to neighbors gunshots were heard at approximately 12:30 a.m. on May 26. Ms. Constable was not home at that time.

Michael Cozzetto, a neighbor, called 9-1-1 at approximately 2:00 a.m. to report that a house and barn were on fire. Ms. Constable was not home at that time. (Hicks RP 324, ll. 20-21; RP 325, ll. 3-8; RP 36, ll. 13-22; RP 327, l. 13 to RP 328, l. 25; RP 329, ll. 1-21)

The State did not present any evidence that Mr. Murry made any direct threats toward Ms. Constable.

The only other relevant evidence produced was Ms. Constable's missing .38. (RP 2745, ll. 14-20; RP 2750, ll. 2-20)

Under the facts and circumstances the State failed to establish that Mr. Murry took a "substantial step" toward the attempted murder of Amanda Constable.

"To constitute a 'substantial step,' the conduct must be strongly corroborative of the actor's criminal purpose." *State v. Luther*, 157 Wn.2d 63, 78, 134 P.3d 205 (2006), *citing State v. Townsend*, 147 Wn.2d 666, 679, 57 P.3d 255 (2002).

Additionally, Mr. Murry asserts that the Information was defective by not including the essential element of premeditation in Count IV.

As recognized in *State v. Commodore*, 38 Wn. App. 244, 247, 684 P.2d 1364 (1984): “Premeditation is a distinct element of the crime of first degree murder.” ... “For this reason, premeditation cannot simply be inferred from the intent to kill.”

Due to the fact that premeditation is an “essential element” of first-degree murder as alleged in Count IV of the Information, and due further to the fact that that element is not included in the charging document, the “essential elements” rule has been violated.

The case of *State v. Vangerpen*, 125 Wn.2d 782, 888 P.2d 1177 (1995) is directly in point. Mr. Vangerpen was charged with attempted first-degree murder. The Information failed to set forth the “essential element” of premeditation. The *Vangerpen* Court ruled at 787:

We have repeatedly and recently insisted that a charging document is constitutionally adequate only if all of essential elements of a crime, statutory and nonstatutory, are included in the document so as to apprise the accused of the charges against him or her and to allow the defendant to prepare a defense. This “essential elements rule” has long been settled law in Washington and is based on the federal and state constitution and on court rule.

Mr. Vangerpen's conviction was reversed and the case was remanded for a new trial.

Where a crime is defined in terms of acts causing a particular result, a defendant charged with attempt must have specifically intended to accomplish that criminal result. W. LaFave & A. Scott, *Criminal Law* § 6.2(c), at 500 (2nd ed. 1986). Therefore, in order to serve as a basis for the crime of attempt, a crime defined by a particular result must include the intent to accomplish that criminal result as an element. *Commonwealth v. Griffin*, 310 Pa. Super. 39, 50-51, 456 A.2d 171 (1983); *People v. Foster*, 19 N.Y.2d 150, 153, 225 N.E.2d 200, 278 N.Y.S.2d 603 (1967).

The crime of murder is defined by the result of death, RCW 9A.32.030, and the rule is well established that the crime of attempted murder requires the specific intent to cause the death of another person. Any lesser mental state ... will not suffice.

State v. Dunbar, 117 Wn.2d 587, 817 P.2d 1360 (1991).

The ruling in *Dunbar* further elucidates and supports Mr. Murry's argument that the lack of the premeditation element in the charging document deprived him of a fair trial. The State failed to appropriately notify him of each and every element of the charged offense. The lack of factual predicates in the Information highlights the lack of compliance with the "essential elements" rule.

II. CIRCUMSTANTIAL EVIDENCE

The State's case relies entirely upon circumstantial evidence. Mr. Murry contends that there is no direct evidence of his involvement. There are no eyewitnesses. His DNA was not found on any items at the scene. No blood from any of the victims was found on his belongings. The WSPCL did not tie in his DNA with any of the evidence. Soil samples from the scene could not be matched to any of the dirt on his boots. Mr. Murry's fingerprints were not found at the scene. There was no footprint evidence. There was no tire track evidence. (RP 3426, l. 20 to RP 3437, l. 15; RP 3445, ll. 2-3; RP 3541, ll. 12-15; RP 3544, ll. 1-15; RP 3701, ll. 11-19; RP 3703, l. 20 to RP 3704, l. 10; RP 3709, l. 24 to RP 3710, l. 19; RP 3713, ll. 7-16; RP 3714, ll. 9-20; RP 3719, ll. 2-14)

... [W]hether direct evidence or circumstantial evidence is more trustworthy and probative depends upon the particular facts of the case and no generalizations realistically can be made that one class of evidence is *per se* more reliable than is the other class of evidence.

State v. Gosby, 85 Wn2d 758, 766, 539 P.2d 680 (1975).

The circumstantial evidence upon which the State relied included:

- Trioxane found in Mr. Murry's Pullman storage unit.

(RP 3873, ll. 1-18; RP 3875, ll. 24-25)

- An inconclusive determination by the WSPCL of a low level of Trioxane on a head lamp found in Mr. Murry's car by the K-9. No Trioxane residue was located at the crime scene.

(RP 2033, l. 24 to RP 2034, l. 7; RP 2132, ll. 1-2; RP 2135, ll. 6-18; RP 2142, ll. 13-16; RP 2146, ll. 13-20; RP 2531, l. 24; RP 2553, ll. 9-15; RP 3544, ll. 16-25; RP 3548, ll. 1-2; RP 3549, ll. 2-5; RP 3549, l. 9 to RP 3550, l. 3; RP 3619, l. 16 to RP 3620, l. 5)

- Mr. Murry's gift of Trioxane to Selina Blimka along with his talking about the fires and knowing who started them even though he would not say who.

(RP 2256, ll. 4-7; RP 2257, ll. 8-16; RP 2260, ll. 10-16; ll. 20-21; RP 2262, ll. 4-8; RP 2265, ll. 8-17)

- A gap on Mr. Murry's cell phone from May 25, 2015 at 1:40 p.m. to May 26, 2015 at 7:40 a.m. His computer was off line from 10:35 a.m. on May 25 to 7:48 p.m. on May 27, 2015.

(RP 3876, ll. 20-23; RP 3877, ll. 15-19; RP 3878, ll. 2-15)

- Testimony that if a burglary of the Canfield residence had occurred then items of value remained in the house which a burglar would normally take.

(RP 1566, ll. 4-15; RP 1626, ll. 3-25; RP 1631, ll. 7-10; RP 1695, l. 10 to RP 1696, l. 20; RP 1732, l. 24 to RP 1733, l. 1; RP 1904, ll. 6-11)

- A Zippo lighter and tops to numerous disposable lighters were found at the scene. Numerous lighters were also located throughout the house.

(RP 1781, ll. 1-6; RP 1782, ll. 8-17; RP 1784, ll. 6-8; ll. 11-13; RP 2143, l. 25 to RP 2144, l. 1)

- Wedding photos and wedding announcements, along with the Murrays marriage certificate were found in the garbage in Lewiston.

(RP 2645, ll. 3-20; RP 2646, ll. 17-21)

- Mr. Murry's familiarity with the Canfield property.

(RP 3845, ll. 1-4; RP 3849, l. 13 to RP 3850, l. 4)

- One of Mr. Murry's Walther .22s was missing.

(RP 4092, l. 22 to RP 4093, l. 4)

- Mr. Murry's lack of an alibi.

(RP 93, l. 19 to RP 94, l. 5; RP 2970, ll 2-22; RP 3854, l. 12 to RP 3856, l. 6; RP 4087, l. 23 to RP 4088, l. 7; Exhibits 924 and 925)

- Amanda Constable's missing .38.

(RP 2745, ll. 14-20; RP 2750, ll. 2-20)

- Mr. and Mrs. Murry were separated.

(RP 2743, ll. 5-14)

A trier of fact may rely on circumstantial evidence alone if the evidence is such that it would support guilt beyond a reasonable doubt. *State v. Kovac*, 50 Wn. App. 117, 119, 747 P.2d 484 (1987). This evidence may include inferences supported by logical probability. *Kovac*, at 120.

State v. Lozano, 76 Wn. App. 116, 121, 882 P.2d 1191 (1994)

The circumstantial evidence in Mr. Murry's case is speculative. Even considering the circumstantial evidence as a whole, there is reasonable doubt as to whether or not Mr. Murry was the actor in the crimes charged.

When the circumstantial evidence is considered in light of the misuse of character evidence, aliases, songs, a hit list and violation of the marital privilege, it becomes obvious that the State was in dire need of some means of impaling Mr. Murry with any arrow in its quiver.

Finally, as set out by the Court in *State v. Sanchez-Valencia*, 148 Wn. App. 302, 315, 198 P.3d 1065 (2009):

... Circumstantial evidence and direct evidence are equally reliable for purposes of drawing inferences. [Citation omitted.] Furthermore, it is not necessary that circumstantial evidence exclude "every reasonable hypothesis consistent with the accused's innocence It is only necessary that the trier of

fact is convinced beyond a reasonable doubt the defendant is guilty.” *State v. Isom*, 18 Wn. App. 62, 66, 567 P.2d 246 (1977) (citing *State v. Gazby*, 85 Wn.2d 758, 539 P.2d 680 (1975)).

Mr. Murry finds it difficult to conceive how any reasonable juror could arrive at a guilty verdict based upon the paucity of direct evidence and the misuse/erroneous introduction of the evidence discussed in the following sections of this brief.

III. CHARACTER EVIDENCE

Defense counsel argued motions in limine concerning numerous aspects of the State’s proposed evidence. These included, in part:

- Mr. Murry’s ownership of multiple guns (RP 2551, l. 12 to RP 253, l. 14);
- Mr. Murry’s viewing certain music videos; (RP 223, ll. 4 to RP 225, l. 8)
- Mr. Murry’s possession of Trioxane.

Additionally, the introduction of testimony involving Mr. Murry’s survivalist tendencies and belief in governmental conspiracies was an unnecessary attack on his character.

Mr. Murry contends that the evidence as outlined in this section of the brief should not have been admitted and contaminated the fairness of the trial.

ER 404(a) states, in part:

Evidence of a person's character or a trait of character is not admissible for the purpose of proving action in conformity therewith on a particular occasion, except:

(1) Character of Accused. Evidence of a pertinent trait of character offered by an accused, or by the prosecution to rebut the same

Initially, Mr. Murry never offered any character evidence. He did not testify. He did not call any witnesses. The State, by introducing character evidence, violated the rule and Mr. Murry's constitutional right to due process and a fair trial.

ER 405(b) states:

Specific Instances of Conduct. In cases in which character or a trait of character of a person is an essential element of a charge, claim, or defense, proof may also be made of specific instances of that person's conduct.

Mr. Murry also asserts, as he did as to the ER 404(a) inadmissible character evidence, that ER 405(b) was violated.

A. Gun Ownership

The trial court ruled on the admissibility of Mr. Murry's guns as follows:

The defendant has filed a number of motions in limine. The first is a motion to exclude the defendant possessing a gun collection. Introducing evidence that he has a gun collection and, therefore, perhaps committed these crimes would be, I guess to some extent, prejudicial. Simply exercising your Second Amendment rights doesn't mean that you're committing crimes. By the same token, that evidence might be relevant to show his familiarity with firearms. It appears a firearm was used in the commission of these offenses.

The court will allow testimony as to some of his firearms to be introduced for a few reasons. One is to show that they weren't used in the commission of this offense if they were tested; second to show his familiarity. **The**

State is prohibited from introducing evidence of a gun collection just to support its assertion that because he has a gun collection, therefore he must have committed these offenses.

(Kerbs RP 257, l. 21 to RP 258, l. 13) (Emphasis supplied.)

Mr. Murry asserts that the State exceeded the limitation placed upon it by the Court. The State did not limit the testimony concerning the guns to those that were tested.

The State introduced a significant amount of testimony concerning Mr. Murry's familiarity with guns and how he would only handle ammunition with gloves. (RP 2291, ll. 6-12; RP 2369, ll. 6-9; ll. 16-20; RP 2725, ll. 15-24; RP 2736, ll. 3-17; RP 2737, ll. 3-10)

Vanessa Kaleikini, a neighbor to the Canfields, testified that Mr. Murry was obsessed with guns and always armed. (Hicks RP 389, ll. 13-25; RP 390, ll. 2-3; RP 394, ll. 17-24)

The overwhelming amount of evidence concerning the number of guns, the thousands of rounds of ammunition, their location in Walla Walla, Lewiston, Pullman and Mr. Murry's car all contributed to an impression

that Mr. Murry was some type of a fanatic. When combined with the survivalist testimony the State had placed Mr. Murry's character at the far side of the extremist movement.

It would appear that Mr. Murry's argument at the motion in limine concerning *State v. Rupe*, 101 Wn.2d 664, 683 P.2d 571 (1984) was well-taken. The *Rupe* Court noted at 706-07:

... [T]he challenged evidence directly implicates defendant's right to bear arms. Const. art. 1, § 24 provides:

The right of the individual citizen to bear arms in defense of himself, or the state, shall not be impaired, but nothing in this section shall be construed as authorizing individuals or corporations to organize, maintain or employ an armed body of men.

This constitutional provision is facially broader than the Second Amendment, which restricts its reference to "a well regulated militia."

Although we do not decide the parameters of this right, here, defendant's behavior - possession of legal weapons - falls squarely within the confines of the right guaranteed by Const. art. 1, § 24. Defendant was thus entitled under our constitution to possess weapons, without incurring the risk that the State would subsequently use the mere fact of possession against him in a criminal trial unrelated to their use. Our conclusion follows from the clear language of Washington's constitution.

The bulk of this adverse testimony/evidence arose from the execution of the search warrants on Mr. Murry's parents' house in Walla Walla, his apartment in Lewiston, the Pullman storage unit and his car.

The Walla Walla search warrant yielded a gun box with gun cleaning equipment; .22 caliber casings; magazines for a Walther P-22; a box with AR-15 magazines; an ammunition box with various brands and calibers of ammo; ammunition in a gym bag; a gun safe in the basement containing additional ammunition; ammunition cans on a closet floor; and rifles in the gun safe which were never directly connected to Mr. Murry as his. (RP 2433, l. 19 to RP 2434, l. 6; RP 2438, ll. 21-23; RP 2440, ll. 18-22; RP 2441, ll. 13-17; RP 2443, ll. 14-17; RP 2444, ll. 1-3; RP 2446, ll. 12-15; RP 2447, ll. 17-20; RP 2449, ll. 2-5; RP 2450, ll. 5-9; RP 2452, ll. 3-6; RP 2453, ll. 6-9; RP 2455, ll. 17-20; RP 2459, ll. 1-25)

The search warrant at the Lewiston apartment revealed multiple ammunition boxes; magazines in tactical holsters; an AR-15 with ammunition; a Ruger 10/22 rifle box with ammunition and a bolt action .22 with a scope. (RP 2582, ll. 1-2; ll. 10-12; RP 2588, ll. 8-9; RP 2596, ll. 12-15; RP 2608, ll. 19-24; RP 2612, ll. 14-19; RP 2616, ll. 17-19; RP 2621, ll. 5-7; RP 2630, l. 13 to RP 2631, l. 9; RP 2631, ll. 18-19; RP 2636, ll. 8-11)

Law enforcement officers located the following upon execution of the search warrant at the Pullman storage locker: two (2) boxes of AR-15 magazines; a wooden trunk with AR-15 magazines; a box with a number of magazines and a sidearm holster. (RP 2411, ll. 19-22; RP 2415, ll. 20-23; RP 2416, ll. 16-20; RP 2427, ll. 6-13)

Finally, the search warrant executed on Mr. Murry's car yielded approximately thirty (30) AR-15 magazines; an empty long rifle box; a Walther P-22 handgun inside a gun case with .22 ammunition, a small vial of liquid, an eye dropper and a replacement barrel; a bag of ammunition and multiple boxes of ammunition. (RP 2531, ll. 5-9; RP 2532, ll. 20-25; RP 2539, ll. 5-20; RP 2542, ll. 23-24; RP 2544, ll. 4-10; RP 2547, ll. 1-7)

Character is an "essential element" in comparatively few cases. 22 C. Wright & K. Graham, *Federal Practice* § 5235 (1978). In criminal cases, character is rarely an essential element of the charge, claim, or defense. 5 K. Tegland, Wash. Prac., *Evidence* § 126, at 312 (1982). For character to be an essential element, character must itself determine the rights and liabilities of the parties. 2 J. Weinstein & M. Berger, *Evidence* ¶ 404 [02] (1979).

State v. Kelly, 102 Wn.2d 188, 196-97, 685 P.2d 564 (1984)

None of the five (5) counts of the Information required testimony of character in order to establish an element of the offense.

Mr. Murry's defense was general denial. Character was not a necessary element of that defense.

As the *Kelly* Court noted at 200:

The restrictions on the use of extrinsic evidence of prior specific instances of conduct are thus a recognition of the axiom that a defendant should be tried only for the offense charged. *State v. Mack*, 80 Wn.2d 19, 21, 490 P.2d 1303 (1971); *State v. Emmanuel*, 42 Wn.2d 1, 253 P.2d 386 (1953).

This now leads into a discussion of the survivalist and conspiracy theorist portions of the evidence.

B. Survivalist

The fact that Mr. Murry may be a survivalist, and fears the eventual collapse of the government, does not have any bearing on whether or not he committed any of the offenses.

What this particular testimony did was poison the jury by essentially declaring that Mr. Murry is a dangerous individual and not to be trusted.

The testimony and exhibits pertaining to Mr. Murry as a survivalist arose from the search warrants, testimony of his friends/acquaintances, and Amanda Constable. (RP 2313, l. 21 to RP 2314, l. 7; RP 2370, ll. 1-17; RP 2708, l. 18 to RP 2709, l. 7; RP 2720, l.24 to RP 2721, l.6)

The various search warrants unveiled a multitude of what can be considered survivalist concerns. These items include:

- Walla Walla - Kevlar shoulder pad for Kevlar vest; and Kevlar helmets in a plastic bag.

(RP 2439, ll. 4-7; RP 2450, ll. 22-23)

- Lewiston apartment - ballistic panels for a vest; a tactical web belt and two-way radio; glow sticks and medical equipment; a black Baklava face cover; a box with canteens and a canister flare; zip ties and flex cuffs.

(RP 2555, l. 24 to RP 2556, l. 1; RP 2556, ll. 6-7, ll. 20-25; RP 2592, ll. 21-22; RP 2594, ll. 12-14; RP 2597, ll.9-11; RP 2607, l. 25 to RP 2608, l. 2; RP 2618, ll. 9-10; RP 2626, ll.1-11)

- Pullman storage locker - road flares; medical supplies including IVs; a wooden box containing gas masks, canisters, spray paint, paracord and other items; another wooden box with lighters, handcuff keys, small pouches used by medics and police on their belts; a plate holder for a bulletproof vest; a bulletproof vest; a box with multiple K-bar knives in sheaths; a box of military items and medical equipment stored in a tote.

(RP 2415, ll. 2-6; RP 2417, ll. 7-11; RP 2418, ll. 7-11; ll. 19-24; RP 2419, ll. 14-20; RP 2420, ll. 4-10; RP 2420, l. 19 to RP 2421, l. 1; RP 2421, ll. 10-

16; RP 2422, ll. 2-6; RP 2423, ll. 6-13; RP 2424, ll. 15-18; RP 2426, ll. 2-8; ll. 17-22)

- Mr. Murry's car - a backpack containing a Secret Ops Handbook; shooting earmuffs; a tactical light with mount and smoke grenades; as well as a disassembled T-15 .223 rifle and ammunition.

(RP 2552, ll. 16-17)

C. Conspiracy Theorist

There was considerable testimony concerning Mr. Murry's belief in conspiracy theories. In fact, he continually referred to Russian involvement, various governmental agencies, and his belief that Lisa Canfield and his wife were Russian agents. (RP 2266, l. 25 to RP 2267, l. 7; RP 2267, ll. 14-19; RP 2280, ll. 1-5; RP 2312, ll. 14-19; RP 2313, l. 21 to RP 2314, l. 7; RP 2341, ll. 8-14; RP 2346, ll. 13-14; RP 2370, ll. 1-17; RP 2502, ll. 6-20; RP 2987, ll. 3-8; RP 2989, ll. 3-6; RP 2990, l. 18 to RP 2991, l. 14)

During his second interview with Detective Keyser, Mr. Murry discussed the Russians and spies. He felt that they were actively involved in the murders. (Kerbs RP 114, ll. 4-13; RP 121, ll. 2-18)

Many of the witnesses described Mr. Murry's conspiracy beliefs. These beliefs were not a recent development with Mr. Murry. The following examples are indicative of Mr. Murry's beliefs:

- Burning an old cellphone so the government couldn't tap it. (RP 2267, ll. 14-19);
- Discussing conspiracy theories with a customer at Café de Vapor. (RP 2278, ll. 15-17; RP 2280, ll. 1-5);
- Describing his wife as the enemy and that the Russians were involved. (RP 2310, ll. 7-22);
- Amanda's involvement with foreign governments and infiltration in the Spokane area. (RP 2502, ll. 6-20);
- Mr. Murry throwing Hailey Gentry's cellphone out the car window on a trip to Montana saying it was bugged. (RP 3023, l. 20 to RP 3024, l. 3)
- Amanda is a "sparrow"; *i.e.*, a mole going into a military installation to infiltrate and gather information. (RP 3047, l. 20 to RP 3048, l. 6; RP 3153, ll. 12-24);
- CIA involvement in connection with foreign governments and being targeted by the Russians. (RP 3061, ll. 13-25);
- The Russian Mafia is involved with Amanda and Lisa. (RP 3294, ll. 2-7);

- In addition to Mr. Murry's claim that he was working for the CIA he also stated that the Russian FSB was recruiting him and that Amanda and Lisa were already part of it. He referenced "Bobby" Caswell as being in the FSB and having a dark team that could have committed the murders. (RP 3862, l. 22 to RP 3863, l. 10; RP 3867, l. 14 to RP 3868, l. 24)

There are many people who believe in government conspiracies. Just because a person believes in a government conspiracy does not make them a cold-blooded killer.

Just because someone is a survivalist does not make them a cold-blooded killer.

Just because someone owns multiple guns does not make them a cold-blooded killer.

Mr. Murry recognizes that evidentiary error is not an error of constitutional magnitude. Nevertheless, he asserts that it was so prejudicial that it is not harmless, and that within a reasonable probability the outcome of his trial was materially affected by the error. (*See: State v. Kelly, supra*, 199)

IV. SONGS

The State argued during a pre-trial motion in limine that certain songs which Mr. Murry had posted on Facebook were relevant to the offenses charged. The songs were “Gasolina” by Daddy Yankee; “Face Everything and Rise” by Papa Roach; and “Revolution” by Diplo. (Kerbs RP 223, ll. 8-19)

The trial court ruled that the songs had minimal relevance and if the State sought to introduce them that the defense could provide the lyrics or a video. (Kerbs RP 241, ll. 7-17)

The Court went on to say, after an inquiry from the State, that if Mr. Murry was the one who posted the songs he was adopting the messages of the songs. It was also determined that the songs were in Spanish and that the State was interpreting them into English. (Kerbs RP 243, l. 11 to RP 244, l. 19)

Later, at that same hearing, the State brought up another song entitled “Burn it Down” by Linkin Park. The trial court ruled that it also was admissible. (Kerbs RP 262, l. 9 to RP 263, l. 7)

Finally, at trial, the State not only introduced the songs previously ruled upon by the trial court; but also introduced videos entitled “Terminator 4,” “Hitman Absolution,” “Hitman Absolution (Trailer),” “Agent 47

Hitman Absolution,” “Hitman Absolution Sniper,” and “Hitman Absolution, Nuns, Guns and Agent 47.” (RP 3237, ll. 3-14; RP 3239, ll. 1-2; ll. 8-9; ll. 13-15; RP 3240, l. 1 to RP 3241, l. 23)

Eventually, the music videos were played for the jury. (RP 3270, ll. 8-25; RP 3271, ll. 10-18; Exhibits 1011, 1012, 1013 and 1014)

Even though the music videos were introduced and played by the defense, the necessity for doing so was the direct result of the trial court’s ruling that the songs were admissible.

If the trial court had not ruled the songs admissible, then, in that event, Mr. Murry’s rights would not have been impacted by the prejudicial inferences that the music videos had some relationship to the offenses.

Moreover, Detective Keyser’s testimony concerning the Facebook songs constituted a further intrusion into the realm of speculation. (RP 3791, l. 24 to RP 3792, l. 11)

Finally, the State emphasized the nature of the songs in its closing argument:

And he also listened to these songs. I want to talk briefly about the songs because as we’re going to talk more about what Mr. Murry posted on his Facebook on the next day. He posted three songs, you’ll recall;

Gasolina, Face Everything and Rise, and Revolution. And then on the night previous, on the 24th in the evening, he -- he hooked himself up with Burn it Down.

You've seen all those videos and you know the evidence in the case. And if you've ever done a workout, if you've ever played a big game, if you've ever had to get up for something, you turn to, among other things, music. Music reflects your mood. Music reflects where you either are or you want to be. And the State would submit to you that this has a great deal to do with Mr. Murry's state of mind in this now ever shortening number of hours between the time that he's doing this research and the time that these three people were killed up at 20 East Chattaroy.

And that's why it's pertinent to say that it's especially important to look at what he was doing then because if -- if you have any doubt as to who did this, this -- fact that

this was going on this particular weekend with Roy Murry is pertinent because of the fact that's when the murders happened; right after the weekend.

The next morning -- again, as I've alluded to on the May 25th, between 7:34 and 7:43 in the morning Mr. Murry posted those other three songs that we talked about, Face Everything and Rise, Revolution, and Gasolina. You know the facts of the case. You know what happened up there at 20 East Chattaroy. It's relevant. It's relevant to not only what happened, but it's also relevant to his state of mind.

(RP 4175, l. 14 to RP 4176, l. 19) (Emphasis supplied.)

Again, the argument was emotional in nature and aimed at inflaming the jury toward Mr. Murry through his choice of rather violent music.

The defense tried once more to counter the State's closing argument as follows:

And the State argues that because he posted these three songs on Facebook, he

must have committed this crime. Well, there's a couple issues with that. If Mr. Murry had committed this crime and he was so skilled to prevent himself from being known to have committed this crime, why on Earth would he be posting songs on his Facebook titled Gasolina, Burn it Down. It doesn't make any sense.

Could it be that Mr. Murry likes music? We know that Mr. Murry posts Facebook music songs before. We have at least up until May 12th where he's posted additional songs. And, really, the important part is you heard the music, you saw the videos. And you'll note that the videos were played by the defense because it's important that you know more than just the title of the songs. It's important to what's in the songs and the videos that you saw and, really, they're not relevant as to what happened in this case.

(RP 4236, ll. 2-18)

Mr. Murry recognizes that the trial court did not have at its disposal the case of *State v. Juarez-Deleon*, 185 Wn.2d 478, 374 P.3d 95 (2016). In the *Juarez-Deleon* case our Supreme Court expressed its dismay with the introduction of musical evidence in connection with gang involvement. The Court stated at 489:

Lastly, we are concerned by some of the questionable musical evidence presented by the State as evidence of gang involvement. This evidence was cited by the Court of Appeals as “untainted” evidence of gang membership. *Deleon*, 185 Wn. App. at 205. For example, the Court of Appeals noted that a song by Los Tigres Del Norte was stored on Anthony Deleon’s cellphone, and indicated that this was evidence of gang involvement. *Id.* at 187. We find this conclusion troublesome. Los Tigres Del Norte has been one of the more prominent bands in Latin music for decades. Since forming in 1968, Los Tigres Del Norte have sold 32 million albums. They have won five Latin Grammy awards, and they have performed in front of United States troops serving abroad. There is no support in the record for the contention that enjoying their music is evidence of gang involvement. While this may not be the primary issue in this case, we felt that it was nonetheless important to take this opportunity to remind courts to exercise far more caution when drawing conclusions from a defendant’s musical preferences.

All in all, even though the music titles and videos were prejudicial, they, in and of themselves, probably would not support reversal of Mr.

Murry's convictions. However, when viewed in light of all the other errors that have been assigned to the proceedings, Mr. Murry contends that they should definitely tip the balance in his favor.

V. ALIAS

Amanda Constable testified concerning Mr. Murry's use of various aliases. These included Michael Collins, Sean Archer and Henry. (RP 2696, ll. 17-24; RP 2697, ll. 1-7)

There is absolutely no valid reason why this testimony was given. It was not objected to. It could easily be used to imply that Mr. Murry had a prior criminal history under those names.

The test as to whether an alias may be used by the State is whether the alias or the other name is relevant and material to prove or disprove any of the issues in the case.

Personal Restraint of Woods, 154 Wn2d 400, 423, 114 P.3d 607 (2005)

Mr. Murry contends that the sole purpose of this testimony was to further prejudice him in the eyes of the jury.

VI. HUSBAND - WIFE PRIVILEGE

RCW 5.60.060(1) provides, in part:

A spouse .. shall not be examined for or against ... her spouse ..., without the consent of the spouse ...; nor can either during marriage ... or afterward, be without the consent

of the other, examined as to any communication made by one to the other during the marriage But **this exception shall not apply to ... a criminal action or proceeding for a crime committed by one against the other**

(Emphasis supplied.)

It would appear that everyone presumed that the husband - wife privilege did not apply based upon Count IV of the Information - attempted first degree murder of Amanda Constable. Mr. Murry asserts that such a presumption is erroneous.

Amanda Constable's testimony was critical for the State.

In addition to the testimony concerning aliases, Amanda Constable was allowed to testify concerning text messages and other communications which occurred during the marriage and which preceded May 26, 2015.

A defense motion to exclude the text messages between Mr. Murry and his wife was denied. (RP 2490, l. 2 to RP 2494, l. 22)

The Court in *State v. Thompson*, 88 Wn.2d 518, 522, 564 P.2d 315 (1977), discussing RCW 5.60.060(1), said

It will be noted that this statute covers two privileges, which are closely related, but separate. The first part of the ... [statute] covers testimony as to factual matters known to the spouse, regardless of how the spouse received the information. The second part ... covers communications between the spouses.

See 5 R. Meisenholder, Wash. Prac. §§ 164, 181 (1965, Supp. 1975).

Mr. Murry contends that both portions of the statute were violated.

As announced in *Breimon v. General Motors, Corp.*, 8 Wn. App. 747, 750, 509 P.2d 398 (1973):

Marital communications are presumptively confidential. *Blau v. United States*, 340 U.S. 332, 95 L. Ed. 306, 71 S. Ct. 301 (1951). The confidence between the parties embraces all knowledge communicated to a spouse because of the relationship. *State v. Americk*, 42 Wn.2d 504, 256 P.2d 278 (1953); *State v. Robbins*, 35 Wn.2d 389, 213 P.2d 310 (1950). Divorce does not allow the spouse to whom the confidential communication was made to release it. *State v. Thorne* [43 Wn.2d 47, 260 P.2d 331 (1953)] at 56; 8 J. Wigmore, *Evidence* § 2341 (J. McNaughton rev. ed. 1961). A spouse should not be placed in fear that a future change in marital status would find his innermost secrets broadcast. *State v. Snyder*, 84 Wash. 485, 147 P. 38 (1915).

The communications in question all occurred during the marriage. Ms. Constable later divorced Mr. Murry and assumed her maiden name of Amanda Constable.

Much of Amanda Constable's testimony was damaging to Mr. Murry's case. A few specific examples are set out below with notations to appendices where applicable:

- Mr. Murry was a hyperalert individual who avoided malls and other places that he did not consider safe. (RP 2720, ll. 2-13)
- Mr. Murry often referred to being “off the grid.” (RP 2720, l. 24 to RP 2721, l. 6)
- Mr. Murry would not touch the ammunition he carried so as to avoid leaving fingerprints. He described it as “shoot and scoot.” (RP 2725, ll. 15-24)
- Mr. Murry would wear gloves for loading magazines and re-loading bullets. (RP 2736, ll. 3-17; RP 2737, ll. 3-10)
- Christmas of 2014 Mr. Murry advised her that her family was trying to poison her against him. (RP 2752, ll. 1-18)
- Multiple text messages from Mr. Murry highlighting his paranoia, lack of trust and tending toward an indication that he intended to do something. (RP 2762, ll. 13-24; RP 2769, ll. 1-21; RP 2771, ll. 1-22; RP 2857, ll. 3-18; Appendix “G”)
- She was concerned how Mr. Murry would react if he no longer thought that she was loyal and trustworthy. (RP 2754, ll. 3-9)

- Mr. Murry never went camping on a Memorial Day weekend during their marriage [2010-2014]. (RP 4087, l. 23 to RP 4088, l. 7)

In addition, Mr. Murry asserts that not only was there a violation of the marital privilege but also the following exchanges were either not relevant or overly prejudicial:

Q. All right. Did you become aware of any specific purchases that Mr. Murry had made without your knowledge?

A. In -- I believe it was in March he purchased a car.

Q. Okay.

A. -- without my knowledge.

Q. And how did you first find out about the vehicle?

A. I think it was I went to meet him to bring him something and he was in it.

Q. All right. Can you describe the car that you saw?

A. It was a black Dodge Caliber.

Q. All right. And back to when you first told him about the potential for a legal separation, what was his reaction to that?

A. Reacted like it was unnecessary and, you know, I wouldn't be affected. But then kind of later on he said that this organization he was working with would be faking his death and so I didn't need the separation. I would have a death certificate and I would just not have to worry about it. I would get his benefits and I -- that there was no need for a separation because as far as the world was concerned, he would be dead.

(RP 2769, ll. 1-21)

A. His behavior became increasingly volatile. There was time when he -- where he seemed like he was working on getting it together and he was going to move to Pullman or Spokane or Walla Walla and get a job or he was going to stay in Lewiston and stay in our apartment.

Q. Okay. In that time period how did his relationship -- during that time frame, what was the relationship as you saw it through his words and actions with your family?

A. It kind of was -- ebbed and flowed as well. He wasn't spending as much time at the house and ...

Q. How about the relationship towards you? Did he make any allegations or anything against you during that time?

A. He just kind of continued to say, like, well, you know, you want to just -- if you want to just leave, leave; like if you want a divorce, just tell me and we'll just do it.

(RP 2771, ll.1-22)

Q. Okay. And the date on that is March 18?

A. 18th.

Q. Okay. And can you -- it's only two boxes, right?

A. Three.

Q. Or three boxes.

Can you tell us what the conversation was?

A. You want me to read them?

Q. Sure. I don't want to put words in your mouth, so ...

A. So from him to me, "So are you looking to just cut ties now. Not that I wouldn't understand but I'm sick of fielding questions constantly from my parents." And I said, "No. I'm the one who doesn't want you to leave in the first place. Remember we still need to talk in the first place." And he said - and the arrows, I can't tell if -- this is also from me. Said "until Monday I didn't know you were serious about leaving."

(RP 2857, ll. 3-18)

"So do you want to rip the band-aid off or not? I'm sick of the rollercoaster ride."

(RP 2860, ll. 17-21)

State v. Thompson, supra, 523, (citing *State v. Briley*, 53 N.J. 498, 251 A.2d 442, 36 A.L.R. 3d 811 (1969)) determined that

[i]f there is a single criminal event in which she and others are targets or victims of the husband's criminal conduct in the totality of the integrated incident and formal charges are made against the husband for some or all the offenses committed (one of which charge is for an offense against the spouse), the wife should be a competent and compellable witness against her husband at the trial of all the cases regardless of whether they are tried separately or in one proceeding. And, in this connection, it should be immaterial that the offense against the wife does not reach the same dimensions of criminality as it does against the third-party victim.

The *Thompson* Court adopted the New Jersey Court's analysis at 424: "We agree with the New Jersey Supreme Court that in this carefully defined situation one spouse should be allowed to testify against the other."

However, the biggest issue involved with the violation of the husband - wife privilege pertains to a so-called "shit list [hit list]."

Initially, the trial court took the issue of the admissibility of the "shit list" under advisement. Nevertheless, it eventually ruled that the marital privilege did not apply and allowed the testimony. (RP 2730, l. 5 to RP 2731, l. 16; RP 2672, l. 12 to RP 2678, l. 8; RP 2872, l. 9 to RP 2881, l. 1; Appendix "H")

Does a "shit list" actually exist? Amanda Constable never saw a written "shit list." Does it exist only in the mind of Mr. Murry? (RP 2897, ll. 2-22; RP 2904, ll. 5-7)

The “shit list” was described as follows:

He just -- throughout our relationship he had like a shit list, just a -- a list of people who had betrayed him that had -- did the opportunity arise, he would kill them. And that was a continuous theme that -- I mean, it wasn't just a one time. He mentioned it just throughout our whole relationship. When something would happen, he would say something about it.

(RP 2893, ll. 15-21)

Again, Amanda Constable never saw such a list. She had no idea if there were any names on that list. She did not know if her family was on that list. (RP 2899, ll. 14-16)

The trial court's reasoning for admitting the testimony is the type of bootstrapping logic that needs to be quelled. The trial court ruled that Mr. Murry's belief system had an impact on Ms. Constable's state of mind as well as having import for the element of premeditation. All of this amounted to pure, unadulterated speculation and conjecture.

Defense counsel cited *State v. Parr*, 93 Wn.2d 95, 606 P.2d 263 (1980) to the trial court. The *Parr* case, referencing *United States v. Brown*, 409 F.2d 758 (D.C. Cir. 1973) adopted its reasoning at 100:

“The rule then to be distilled from the better reasoned decisions is that a victim’s extra-judicial declarations of fear of the defendant are admissible under the state of mind exception to the hearsay rule with a limiting instruction **only if there is a manifest need for such evidence, i.e., if it is relevant to a material issue in the case.** Where there is a substantial likelihood of prejudice to the defendant’s case in the admission of such testimony, it is inadmissible if it bears only a remote or artificial relationship to the legal or factual issues raised in the case. Even where there is substantial relevance, the additional factual matters in the statement may simply be too explosive to be contained by the limiting instruction, in which case exclusion of the testimony is also necessitated.”

(Emphasis supplied.)

VII. COMPETENCY

In addition to the character evidence discussed in the preceding portion of this brief, Mr. Murry exhibited a substantial amount of paranoia that preceded the May 26, 2015 offenses. The paranoia is akin to the character evidence that was erroneously entered.

Moreover, the paranoia evidence tended to smear Mr. Murry as unstable and more likely than not to have committed the offenses.

Trial counsel did not question Mr. Murry's competency. Nevertheless, a question of competency arises based upon the evidence that was admitted at trial.

An accused person has a fundamental right not to stand trial unless legally competent. *State v. Wicklund*, 96 Wn.2d 798, 800, 638 P.2d 1241 (1982) (citing *Drope v. Missouri*, 420 U.S. 162, 172, 95 S. Ct. 896, 43 L. Ed.2d 103 (1975)). This right is guaranteed by the due process clause of the Fourteenth Amendment. See: U.S. CONST. amend XIV; *State v. Coley*, 180 Wn.2d 543, 551, 326 P.3d 702 (2014), *cert. denied*, 135 S. Ct. 1444 (2015).
...

The United States Supreme Court established the federal test for competency in *Dusky v. United States*, 362 U.S. 402, 80 S. Ct. 788, 4 L. Ed. 2d 824 (1960). Under *Dusky*, a defendant is competent if he has “sufficient present ability to consult with his lawyer with a reasonable degree of rational understanding ... [and] a rational as well as factual understanding of the proceedings against him.” *Id.* At 402. In *Drope*, the Court equated “ability” with “capacity,” holding that a defendant is incompetent under *Dusky* if he “lacks the capacity to understand the nature and object of the proceedings against him, to consult with counsel, and to assist in preparing his defense.” 420 U.S. at 171, see also *Godinez v. Moran*, 509 U.S. 389, 402, 113 S. Ct. 2680, 125 L. Ed.2d 321 (1993). (“Requiring that a criminal defendant be competent has a modest aim: It seeks to ensure that he has the capacity to understand the proceedings and to assist counsel.”). Washington competency law has

adopted - and further developed - this capacity-based standard.

State v. Ortiz-Abraego, 187 Wn.2d 395, 402-03, 387 P.3d 638 (2017)

The following testimony is indicative of Mr. Murry's mental state during the period preceding May 26, 2015:

- Mr. Murry appeared dry and dejected as opposed to upbeat. (RP 2309, l. 19 to RP 2310, l. 2; RP 2502, l. 21 to RP 2503, l. 15)
- Mr. Murry had lost weight, had a different haircut, his hair was dyed and he said people were after him and he needed to keep a low profile. (RP 2346, ll. 4-10; ll. 13-14; RP: 3151, ll. 10-23)
- On a trip to Bend, Oregon and back Mr. Murry discussed various traffic patterns and the significance of other nearby cars as having some meaning to him. Included were odd conversations about the CIA and Russians. (RP 2765, ll. 1-10; RP 2766, l. 17 to RP 2767, l. 11; RP 2892, ll. 2-10; RP 3027, l. 19 to RP 3028, l. 7; RP 3064, l. 10 to RP 3065, l. 12; RP 3077, l. 2 to RP 3078, l. 2)

- Discussing aliens and accusing Amanda and Lisa of being with the Russians. (RP 2859, l. 21 to RP 2860, l. 15)
- Additional discussions about aliens and people being changelings, Russian spies and prior institutionalization. (RP 2986, ll. 3-24; RP 2987, ll. 3-8)
- Claiming to be a shape shifter. (RP 2891, ll. 2-9)
- Mr. Murry's behaviors and patterns had changed and he was no longer easy to read. (RP 2893, ll. 2-9)
- Mr. Murry claiming to be in a witness protection program and working for government agencies. (RP 2989, ll. 13-20)
- Mr. Murry's habit of conducting sweeps of houses even when he was only visiting. (RP 2315, ll. 4-25; RP 2372, l. 10 to RP 2373, l. 10; RP 2837, ll. 2-4; RP 2957, ll. 14-25; RP 3010, ll. 2-8)
- Mr. Murry valued loyalty and trust and trusted a very small group, including Amanda Constable. (RP 2734, ll. 14-21)

The extent to which this apparent paranoia may have impacted Mr. Murry was never clearly explained at trial. The absence of a competency evaluation is troubling.

Nevertheless, the State's broadside attack on Mr. Murry's character and mental state could not have had anything other than an adverse impact on the jury. *See*: DSM V, § 301.0 - Paranoid Personality Disorder (Appendix "I")

VIII. EXPERT TESTIMONY (FRYE) HEARING

ER 702 states:

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.

The two experts in question are William Schneck of the WSPCL and Richard Brown of MVA Scientific Consultants.

They testified concerning the Scanning Electron Microscope (SEM) and Transmission Electron Microscope (TEM). Both devices were used to try and identify a substance located on one of the shell casings from the crime scene.

Mr. Murry does not challenge either of the individuals expertise. Rather, he challenges the trial court's determination that the *Frye* standard was met.

Frye v. United States is implicated only where "either the theory and technique or method of arriving at the data relied upon is

so novel that it is not generally accepted by
the relevant scientific community.”

L.M. v. Hamilton, 200 Wn. App. 535, 539 (2017), (quoting *Lake v. Puget Sound Energy, Inc.*, 176 Wn.2d 909, 919, 296 P.3d 860 (2013) (quoting *Anderson v. Akzo Nobel Coatings, Inc.*, 172 Wn.2d 593, 611, 260 P.3d 857 (2011))). (Emphasis supplied.)

Mr. Schneck had never seen the type of substance observed on the cartridge. He did determine, using the SEM, that the particles contained magnesium and a silicate. (Kerbs RP 312, l. 22 to RP 313, l. 11; RP 314, ll. 2-3)

Mr. Schneck’s determination, after using the SEM, was inconclusive. This meant “I can’t render an opinion as if that particle came or did not come from a particular material.” (Kerbs RP 342, ll. 13-18)

Since Mr. Schneck had never seen this type of particle before, and the SEM did not provide sufficient magnification, he took a sample to MVA for examination by the TEM. (Kerbs RP 322, ll. 1-22; RP 327, ll. 4-23; RP 340, ll. 16-25)

It is at this point that Mr. Murry begins his challenge of Mr. Schneck’s and Mr. Brown’s testimony. The challenge essentially goes to the trial court’s Conclusions of Law E, J and K.

Insofar as Conclusion of Law E is concerned Mr. Murry has already acknowledged the individual's expertise. He also acknowledges that the SEM and TEM are recognized devices for examination of minute particles such as nanoparticles. He does question which scientific community is to be considered.

Is it the general scientific community? Is it only criminal forensics?

Moreover, he challenges whether the testimony is helpful to the trier of fact. Mr. Schneck's inconclusive determination indicates otherwise.

Mr. Brown testified that the TEM had not been used in criminal forensic science to his knowledge. (Kerbs RP 355, ll. 11-17)

Mr. Brown had never done testing in a criminal case before this case. (Kerbs RP 381, ll. 3-7)

Mr. Brown indicated that the type of analysis that was done in Mr. Murry's case (comparability of evidence) had never been done by him before. (Kerbs RP 383, l. 23 to RP 384, l. 14)

Mr. Brown's testing showed the presence of lead particles which did not appear when the SEM was used. (Kerbs RP 392, l. 8 to RP 393, l. 16)

No testing was done as to other gun lubricants. (Kerbs RP 394, ll. 6-16)

Additionally, Mr. Brown was only able to determine that the material found on the cartridge was "consistent with," which is not the same as

“conclusive,” with Accudure. (Kerbs RP 406, l. 2 to RP 407, l. 2; RP 3961, ll. 8-15)

The trial court’s Conclusion of Law J pertains to the credibility of the methodology used as opposed to the admissibility of the opinion. The methodology was not in question. The expert’s opinion was not in question. What was in question is whether or not the opinions should have been allowed since they were not conclusive.

The same objection applies to Conclusion of Law K.

As stated in *State v. Gore*, 143 Wn.2d 288, 302, 21 P.3d 262 (2001):

The primary goal of a *Frye* analysis is to determine whether the evidence offered is based on established scientific methodology. *State v. Russell*, 125 Wn.2d 24, 41, 882 P.2d 747 (1994). **There must be both general acceptance in the relevant scientific community of the theory and of the technique used to implement the theory.** *Id.*; *State v. Cauthron*, 120 Wn.2d 879, 889, 846 P.2d 5502 (1993). Unanimity is not required. *State v. Copeland*, 130 Wn.2d 244, 270, 922 P.2d 1304 (1996). If there is a *significant* dispute among *qualified* scientists in the relevant scientific community, then the evidence may not be admitted. *State v. Gentry*, 125 Wn.2d 570, 585-86, 888 P.2d 1105 (1995). **If the *Frye* test is satisfied, then the trial court must determine admissibility under ER 702.** *Copeland*, 130 Wn.2d at 256.

(Emphasis supplied.)

Mr. Murry contends that the relevant scientific community is criminal forensic science. The SEM is recognized in that field. The TEM is not. It is hard to conceive that there is a significant dispute among qualified scientists when a particular device has never been used to examine evidence in a criminal proceeding.

Neither Mr. Schneck's nor Mr. Brown's testimony varied much from the testimony at the *Frye* hearing. Mr. Schneck testified that he could identify the particles as magnesium and silica; but could not determine their shape because they were nanoparticulates. (RP 3555, ll. 7-22)

Pavlo Rudenko, the developer of Accudure, who has a PhD and is certified as a lubricant and grease specialist, developed Accudure using nanoparticles⁴. (RP 3452, ll. 15-22; RP 3455, l. 25 to RP 3456, l. 5)

Accudure was not being sold in 2015. Mr. Murry had been involved with Mr. Rudenko in the potential marketing of Accudure. (RP 2739, ll. 11-21; RP 3346, ll. 14-24; RP 3461, ll. 15-17)

Magnesium and silicon are two (2) of the most common elements found in nature. *See*: Appendices "E" and "F."

⁴ A nanoparticle is a particle with at least one dimension which has one hundred nanometers or less. (RP 3905, ll. 23-24)

Richard Brown, at trial, described the operation of the TEM. It passes electrons through a sample and it in essence results in looking at the shadow of what they passed through. (RP 3914, ll. 5-11)

Mr. Brown stated that the test fired casings numbered 27, 107 and 217, reflected the presence of magnesium silica consistent with the sample of Accudure. (RP 3931, ll. 23-25; RP 3936, ll. 12-18)

He further indicated that the magnesium silicate particles were not exclusive to the Accudure; but just consistent with it. There may be other sources within the environment of which he was unaware. It was the first time he had ever seen this type of particle. (RP 3939, l. 16 to RP 3940, l. 20; RP 3941, ll. 3-16; RP 3961, ll. 5-15)

On cross-examination Mr. Brown admitted that MVA had never used the TEM in a criminal case. He was unaware of any scientific journal articles in existence that would reflect the particular testing done in Mr. Murry's case. (RP 3952, ll. 3-9; ll. 14-19)

Mr. Brown noted that the casings from the test firing had lead associated with them. The lead was within the particular magnesium silicate nanoparticle. This differed from the crime scene casing. (RP 3962, ll. 3-25; Appendix "J")

Mr. Brown further described this as a variable without explanation. (RP 3963, ll. 2-19)

Mr. Brown did not examine any other gun lubricants. He could not conclusively say that the particulates on the casings came exclusively from Accudure. (RP 3966, ll. 19-25; RP 3969, ll. 6-15)

It is Mr. Murry's position that the inconclusive results allowed the jury to speculate about whether or not Accudure was the substance that was found on the one crime scene casing. Conjecture and speculation cannot be condoned.

In *Davidson v. Metropolitan Seattle*, 43 Wn. App. 569, 571-72, 719 P.2d 569 (1986), the Court stated:

The rule governing the admissibility of expert testimony is ER 702. **Once the court is satisfied with the witnesses' expertise, the test for admissibility is whether the testimony "will assist the trier of fact to understand the evidence or to determine a fact in issue."** ER 702; 5 A K. Tegland, Wash. Prac. § 291 (1982); *State v. Petrich*, 101 Wn.2d 566, 575, 683 P.2d 173 (1984). The court should also consider whether the issue is of such a nature that an expert could express **"a reasonable probability rather than mere conjecture or speculation."** 5A K. Tegland, at 36. In addition, **when ruling on somewhat speculative testimony, the court should keep in mind the danger that the jury may be overly impressed with a witness possessing the aura of an expert.** *United States v. Fosher*, 590 F.2d 381 (1st Cir. 1979).

(Emphasis supplied.)

An abuse of discretion standard is applied in deciding whether or not a trial court has erred in ruling on the admissibility of expert testimony. *See: Johnston-Forbes v. Matsunaga*, 181 Wn.2d 346, 352, 333 P.3d 388 (2014).

An abuse of discretion occurs

“[w]here the decision or order of the trial court is ... manifestly unreasonable, or exercised on untenable grounds, or for untenable reasons.

State ex. rel. Carroll v., Junker, 79 Wn.2d 12, 26, 482 P.2d 775 (1971)

Finally, Mr. Murry argues that the SEM and TEM comparability analysis in his case is substantially similar to the gas chromatography accelerant comparisons conducted in *State v. Huynh*, 49 Wn. App. 192, 196-98, 742 P.2d 160 (1987).

When a particular type of comparability analysis is conducted, that has never been conducted before, then it is a novel procedure. A novel procedure which does not give conclusive results, is not peer reviewed, and does not have some type of scientific control, is unacceptable in a court of law. The trial court's ruling amounts to an abuse of discretion.

IX. CUMULATIVE EVIDENCE

Mr. Murry concedes in some respects that the individual assignments of error and issues may not be sufficient to result in a reversal of his convictions. However, their combined prejudicial effect which allowed the jury to consider conjecture, speculation, inconclusive results, uncalled for aliases, attacks on character, suspect expert testimony, and questions of competency together amount to a trial that violated Mr. Murry's constitutional right to due process under the Fourteenth Amendment to the United States Constitution and Const. art. I, § 22.

“The cumulative error doctrine applies when several trial errors occurred, and none alone warrants reversal, but the combined errors effectively denied the defendant a fair trial.” *State v. Jackson*, 150 Wn. App. 877, 889, 209 P.3d 553 (2009).

Mr. Murry asserts that he has carried his burden of proof that the accumulation of error is of sufficient magnitude that retrial is necessary.

CONCLUSION

Roy Edward Murry's trial was seriously flawed. The evidence at trial violated ER 404(a), ER 405 and ER 702. Its cumulative impact was prejudicial and denied Mr. Murry his constitutional right to a fair and impartial trial.

The use of aliases, unwarranted and adverse character evidence, music videos and the violation of the marital privilege compounded other trial errors.

The trial court's determination that expert testimony met the *Frye* standard and would be helpful to the jury is not substantiated by the inconclusiveness of the experts' opinion.

Error in Count IV of the Information denied Mr. Murry full knowledge of the nature of the offense of attempted first degree murder in contravention of the essential elements rule. In addition, insufficient evidence was presented to establish each and every element of that offense beyond a reasonable doubt.

The conviction of Count IV should be reversed and dismissed. Mr. Murry is entitled to a new trial on the remaining counts.

DATED this 30th day of July, 2018.

Respectfully submitted,

s/ Dennis W. Morgan

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APPENDIX “A”

FILED
NOV 08 2016
Timothy W. Fitzgerald
SPOKANE COUNTY CLERK

IN THE SUPERIOR COURT OF THE STATE OF WASHINGTON
IN AND FOR THE COUNTY OF SPOKANE

9	STATE OF WASHINGTON,)	
)	NO. 151024222
10	Plaintiff,)	
)	FINDINGS OF FACT/CONCLUSIONS
11	v.)	OF LAW RE: FRYE HEARING
)	
12	ROY H. MURRY,)	
)	
13	Defendant.)	

This matter came before the above-entitled court for a Frye hearing on November 4, 2016, as to the admissibility of expert testimony regarding testing of substances at issue in this case. The State being represented by Larry Haskell, Prosecuting Attorney, and Jack Driscoll, Chief Deputy Prosecuting Attorney; the defendant being present and represented by his attorneys, Jill Gannon Nagel and Tom Krzyminski. The court having reviewed the files and records herein; having heard the testimony of Bill Schneck, WSP Crime Lab, and Rich Brown, MVA Laboratory, and otherwise being fully advised, NOW THEREFORE, makes the following:

I. FINDINGS OF FACT

1. **UNDISPUTED FACTS**

1. Both Scanning Electron Microscopy (SEM) and Transmission Electron Microscopy (TEM) were used in the testing of a lubricant at issue in this case.

FINDINGS OF FACT AND CONCLUSIONS
OF LAW RE: FRYE HEARING

Page 1

SPOKANE COUNTY PROSECUTING ATTORNEY
COUNTY CITY PUBLIC SAFETY BUILDING
SPOKANE, WA 99260 (509) 477-3662

1 F. There was no evidence that anyone disputes the accuracy of the scientific
2 process of either the SEM or the TEM used in this case.

3 G. There is no evidence that the process as applied in the tests was not done in a
4 manner that is generally accepted in the scientific community to determine the composition and
5 appearance of the sample.

6 H. The Court finds by a preponderance of the evidence that the SEM and TEM
7 techniques are generally accepted in the scientific community to determine the composition of a
8 sample.

9 I. There is no evidence that the experts' methodology for determining the elemental
10 composition of the samples isn't capable of producing accurate results.

11 J. Any objection to the methodology as applied in a specific instance goes to the
12 credibility and not to the admissibility of the experts' opinion.

13 K. The Court finds by a preponderance of the evidence that Mr. Schneck and Mr.
14 Brown qualify as experts, that they have relied on theories that are generally acceptable in the
15 scientific community, and that their testimony would be helpful to the trier of fact.

16 L. The experts may testify at trial.

17 M. The Court incorporates its oral findings of fact and conclusions of law. The
18 transcript is attached to this order.

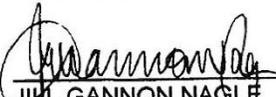
19 DATED this 8th of November, 2016.

20  **JOHN O. COONEY**
21 _____
22 JUDGE

23 Presented by:

24 
25 **LARRY HASKELL**
Prosecuting Attorney
WSBA #27826

Agreed to:


JILL GANNON NAGLE AS TO FORM
Attorney for Defendant OBJECTIONS ON RECORD
WSBA #39311

FINDINGS OF FACT AND CONCLUSIONS
OF LAW RE: FRYE HEARING

Page 3

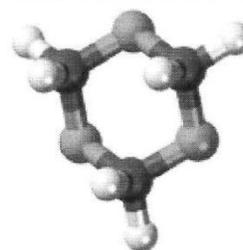
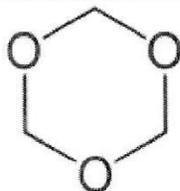
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APPENDIX “B”

1,3,5-Trioxane

1,3,5-Trioxane, sometimes also called **trioxane** or **trioxin**, is a chemical compound with molecular formula $C_3H_6O_3$. It is a white solid with a chloroform-like odor. It is a stable cyclic trimer of formaldehyde, and one of the three trioxane isomers; its molecular backbone consists of a six-membered ring with three carbon atoms alternating with three oxygen atoms. Thus, cyclotrimerization of formaldehyde affords 1,3,5-trioxane:

1,3,5-Trioxane



Names

IUPAC name

1,3,5-Trioxane

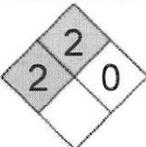
Other names

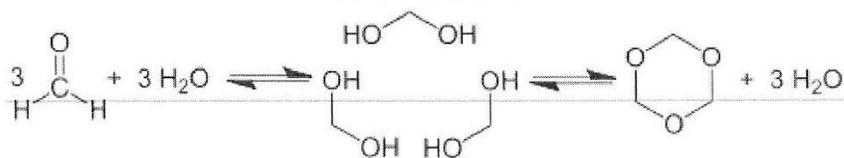
s-Trioxane; 1,3,5-Trioxacyclohexane;

Trioxymethylene; Metaformaldehyde; Trioxin

Identifiers

CAS Number	110-88-3 (http://www.commonchemistry.org/ChemicalDetail.aspx?ref=110-88-3) [✓]
3D model (JSmol)	Interactive image (http://chemapps.stolaf.edu/jmol/jmol.php?model=O1COCOC1)
ChEBI	CHEBI:38043 (https://www.ebi.ac.uk/chebi/searchId.do?chebiid=38043) [✓]
ChemSpider	7790 (http://www.chemspider.com/Chemical-Structure.7790.html) [✓]
ECHA InfoCard	100.003.466 (https://echa.europa.eu/substance-information/-/substanceinfo/100.003.466)
RTECS number	YK0350000
UNII	46BNU65YNY (https://fdasis.nlm.nih.gov/srs/srsdirect.jsp?regno=46BNU65YNY) [✓]
InChI	

SMILES	
Properties	
Chemical formula	C ₃ H ₆ O ₃
Molar mass	90.08 g·mol ⁻¹
Appearance	White crystalline solid
Density	1.17 g/cm ³ (65 °C) ^[1]
Melting point	62 °C (144 °F; 335 K) ^[1]
Boiling point	115 °C (239 °F; 388 K) ^[1]
Solubility in water	221 g/L ^[1]
Hazards	
R-phrases <i>(outdated)</i>	R22
S-phrases <i>(outdated)</i>	S24/25
NFPA 704	
Flash point	45 °C (113 °F) ^[1]
Related compounds	
Related compounds	Formaldehyde 1,2,4-Trioxane Polyoxymethylene
<p>Except where otherwise noted, data are given for materials in their standard state (at 25 °C [77 °F], 100 kPa).</p> <p style="text-align: right;">✓ verify (what is ^{xx} ?)</p> <p style="text-align: right;">Infobox references</p>	

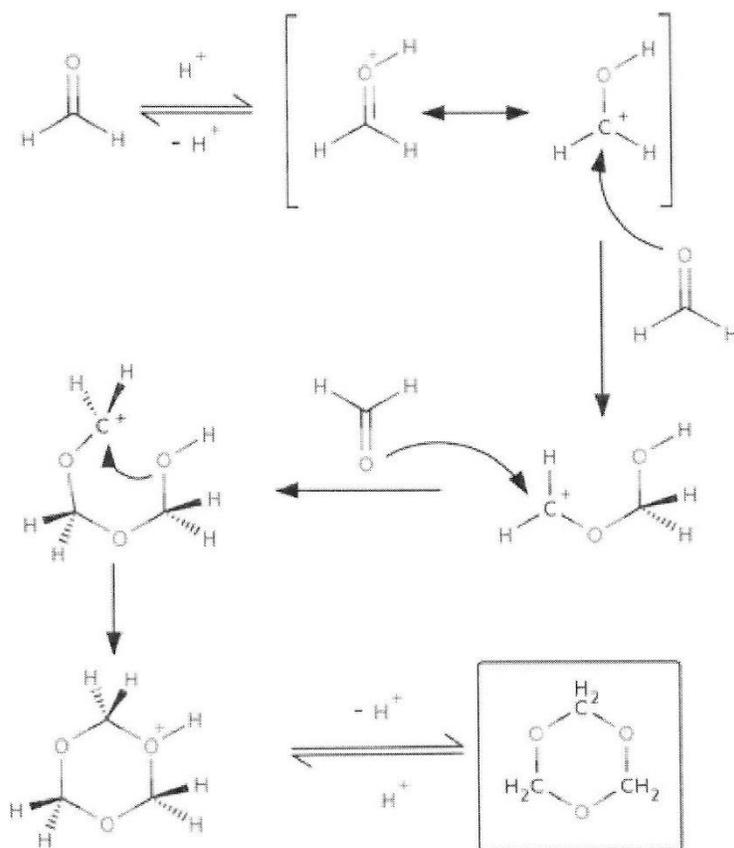


Contents

- 1 **Production**
- 2 **Uses**
- 3 **See also**
- 4 **References**

Production

Trioxane is produced by trimerization of formaldehyde using acid catalysts. The reaction is conducted in concentrated aqueous solution and the product is separated by solvent extraction. An idealized mechanism is shown below:



Uses

Trioxane is mainly consumed in the production of polyoxymethylene plastics, of which about 1M tons/y are produced.^[2] Other applications exploit its tendency to release formaldehyde. As such it is used as a binder in textiles, wood products, etc. Trioxane is combined with hexamine and compressed into solid bars to make hexamine fuel tablets, used by the military and outdoorsmen as a cooking fuel.

In the laboratory, trioxane is used as an anhydrous source of formaldehyde.^[3]

See also

- [Formaldehyde](#)
- [Paraformaldehyde](#)
- [Dioxane](#)
- [1,3,5-Trioxanetrione](#)

References

1. Record ([http://gestis-en.itrust.de/nxt/gateway.dll?f=id\\$t=default.htm\\$vid=gestiseng:sdbeng\\$cid=029710](http://gestis-en.itrust.de/nxt/gateway.dll?f=id$t=default.htm$vid=gestiseng:sdbeng$cid=029710)) in the GESTIS Substance Database of the [Institute for Occupational Safety and Health](#)
2. Günther Reuss, Walter Disteldorf, Armin Otto Gamer, Albrecht Hilt "Formaldehyde" in *Ullmann's Encyclopedia of Industrial Chemistry*, 2002, Wiley-VCH, Weinheim. doi:10.1002/14356007.a11_619 (https://doi.org/10.1002%2F14356007.a11_619)
3. W. O. Teeters and M. A. Gradsten "Hexahydro-1,3,5-tripropionyl-s-triazine" *Org. Synth.* 1950, volume 30, 51. doi:10.15227/orgsyn.030.0051 (<https://doi.org/10.15227%2Forgsyn.030.0051>)

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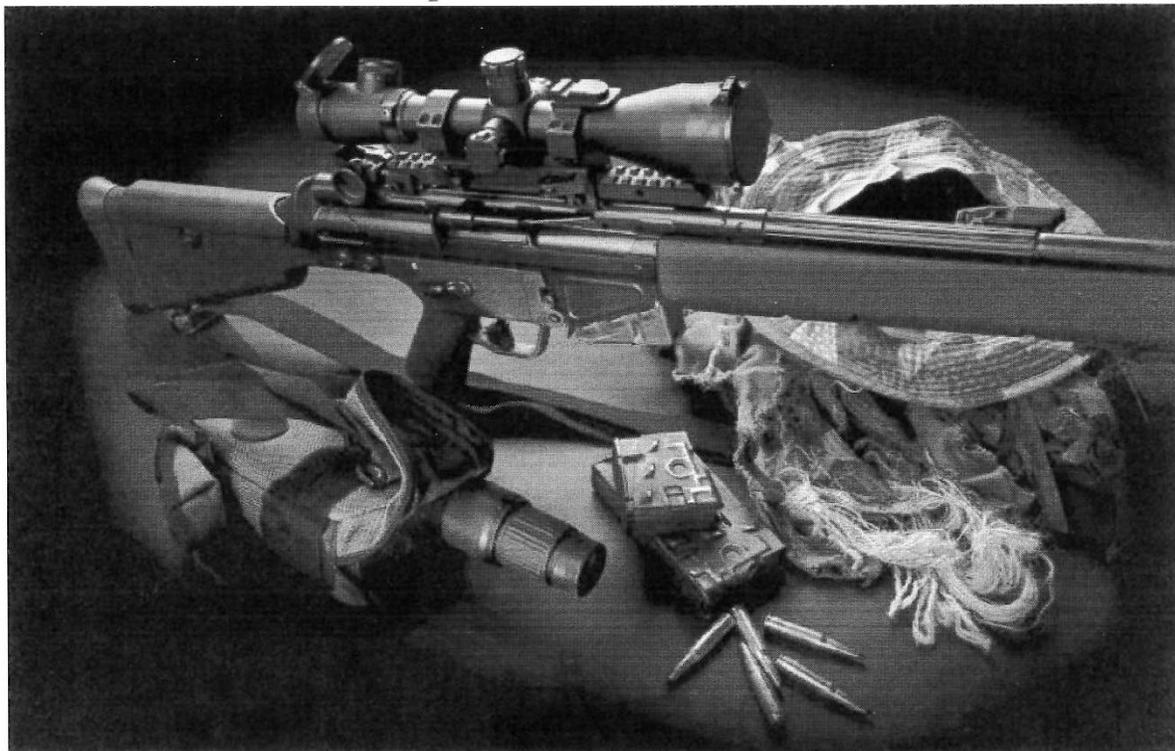
APPENDIX “C”



COATINGS ACCURACY DURABILITY TESTIMONIALS ABOUT CONTACT

- HANDGUN
- HUNTING RIFLE
- SEMIAUTOMATIC RIFLE
- SNIPER RIFLE

AccuDure for Sniper Rifles



1. Telescopic sights.
2. Quality rifle manufacturing.



What if you could smooth your bore and lubricate it simply by firing it?

3. AccuDure barrel coating.

The broaching of barrels naturally leaves micro pitting. This leaves the problem of minor imperfections internally which affect the internal ballistics of the bullet. They affect both the internal bore in the form of wear and the bullet in the form of imperfect striations. The way you can smooth your rifle bore and lubricate it – simply by firing it – is by applying AccuDure internal bore coating.

Reduce the imperfections from barrel manufacturing.

AccuDure helps transform sniper rifles into the most accurate and efficient weapons.

In sniping, all external ballistic factors must be accounted for. However, this method does not account for all internal ballistic effects. While most initial internal ballistic factors including: primer, powder burn, quantity and expansion factors, as well as bullet weight are accounted for; the barrel itself provides an

unaccounted for factor. Due to imperfections in the machining process, even sniper rifles have deviations in precision which can be accounted for in terms of Minutes of Angle (MOA) at the 100 yard mark. At this range, many rifles have deviations in excess of ¼ MOA, even sniper weapons are likely to exhibit ¼ MOA or less deviations, unaccounted for in external ballistic factors.

AccuDure makes a difference in eliminating uncontrolled variables.

Holding all external ballistic and quantifiable internal ballistic factors equal, theoretically the terminal ballistic characteristics exhibited should be identical shot to shot. This is not the case. While sometimes external factors may



Bolivian Jaguar sniper rifle.

cause this deviation, a truly skilled sniper will read the wind and calculate properly. However, in fine tuning our equipment we have never eliminated certain critical variables. These are the factors which AccuDure seeks not only to control, but also to eliminate.

AccuDure: Two-part internal firearm barrel coating.



**AccuDure for
Sniper Rifles
Buy Now \$238**

Long-lasting, protective coating prevents barrel friction and minimizes metal-to-metal wear. Augments firearm precision and velocity. Made in the USA. Clear liquid engineered nanotechnology materials. Store under controlled conditions. Activation 30 rounds minimum (15 for each bottle). Application interval is annually maximum and every 1,000 rounds minimum. AccuDure does NOT contain any silicone or PTFE (Teflon*) type ingredients and never gets sticky or tacky. Does not attract dust, dirt or grime. (*Teflon is a registered trade name). No special tools or toxic cleaner needed. All AccuDure coatings will not harm plastic gun parts or polymers or original factory wood finishes.



AccuDure Coating
Included with purchase.
30 milliliter / 8.1 dram
h 87mm, dia 25mm
Amber-glass, UV-resistant, screw-thread vial.
Straight glass dropper with black rubber bulb. Tamper-evident cap.

Sniper Barrel Treatment
\$238
10 milliliter / 2.7 dram
h 87mm, dia 25mm
Amber-glass, UV-resistant, screw-thread vial.
Straight glass dropper with black rubber bulb.

INSTRUCTIONS

1. Apply Barrel Treatment to the bore using a cleaning patch.
Then coat the bullet with one drop and fire once
2. Repeat for 15 rounds minimum.
3. Apply Coating in the same way.

WARNINGS

Both vials:
Flammable.
Contains engineered nanomaterials.
Avoid skin exposure.
Harmful or fatal if swallowed.



SPECIALIZED FIREARM CARE

Insignia & Company develops, manufactures, and markets scientific internal coatings for handgun and rifle barrels.

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APPENDIX “D”

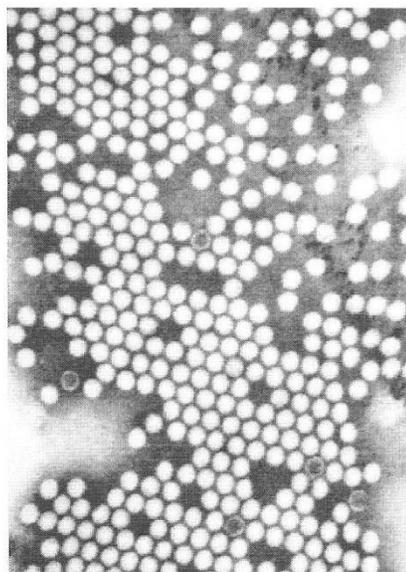
Transmission electron microscopy

Transmission electron microscopy (TEM, also sometimes **conventional transmission electron microscopy** or **CTEM**) is a microscopy technique in which a beam of electrons is transmitted through a specimen to form an image. The specimen is most often an ultrathin section less than 100 nm thick or a suspension on a grid. An image is formed from the interaction of the electrons with the sample as the beam is transmitted through the specimen. The image is then magnified and focused onto an imaging device, such as a fluorescent screen, a layer of photographic film, or a sensor such as a charge-coupled device.

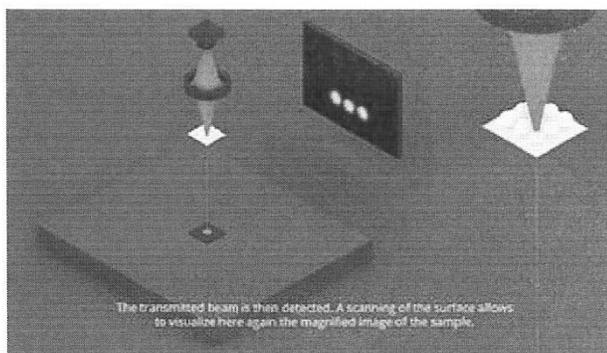
Transmission electron microscopes are capable of imaging at a significantly higher resolution than light microscopes, owing to the smaller de Broglie wavelength of electrons. This enables the instrument to capture fine detail—even as small as a single column of atoms, which is thousands of times smaller than a resolvable object seen in a light microscope. Transmission electron microscopy is a major analytical method in the physical, chemical and biological sciences. TEMs find application in cancer research, virology, and materials science as well as pollution, nanotechnology and semiconductor research.

At lower magnifications TEM image contrast is due to differential absorption of electrons by the material due to differences in composition or thickness of the material. At higher magnifications complex wave interactions modulate the intensity of the image, requiring expert analysis of observed images. Alternate modes of use allow for the TEM to observe modulations in chemical identity, crystal orientation, electronic structure and sample induced electron phase shift as well as the regular absorption based imaging.

The first TEM was demonstrated by Max Knoll and Ernst Ruska in 1931, with this group developing the first TEM with resolution greater than that of light in 1933 and the first commercial TEM in 1939. In 1986, Ruska was awarded the Nobel Prize in physics for the development of transmission electron microscopy.^[2]



A TEM image of a cluster of poliovirus. The polio virus is 30 nm in diameter.^[1]



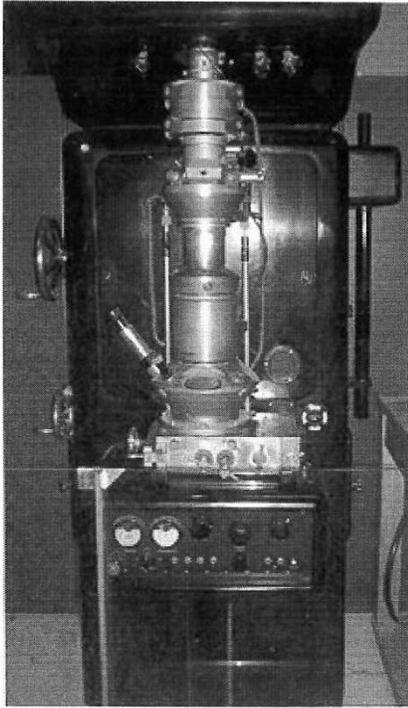
Operating principle of a Transmission Electron Microscope

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History

Initial development



The first practical TEM, originally installed at IG Farben-Werke and now on display at the Deutsches Museum in Munich, Germany

In 1873, Ernst Abbe proposed that the ability to resolve detail in an object was limited approximately by the wavelength of the light used in imaging or a few hundred nanometers for visible light microscopes. Developments in ultraviolet (UV) microscopes, led by Köhler and Rohr, increased resolving power by a factor of two.^[3] However this required expensive quartz optics, due to the absorption of UV by glass. It was believed that obtaining an image with sub-micrometer information was not possible due to this wavelength constraint.^[4]

In 1858 Plücker observed the deflection of "cathode rays" (electrons) with the use of magnetic fields.^[5] This effect was used by Ferdinand Braun in 1897 to build simple cathode ray oscilloscopes (CROs) measuring devices.^[6] In 1891 Riecke noticed that the cathode rays could be focused by magnetic fields, allowing for simple electromagnetic lens designs. In 1926 Hans Busch published work extending this theory and showed that the lens maker's equation could, with appropriate assumptions, be applied to electrons.^[2]

In 1928, at the Technical University of Berlin, Adolf Matthias, Professor of High voltage Technology and Electrical Installations, appointed Max Knoll to lead a team of researchers to advance the CRO design. The team consisted of several PhD students including

Ernst Ruska and Bodo von Borries. The research team worked on lens design and CRO column placement, to optimize parameters to construct better CROs, and make electron optical components to generate low magnification (nearly 1:1) images. In 1931 the group successfully generated magnified images of mesh grids placed over the anode aperture. The device used two magnetic lenses to achieve higher magnifications, arguably creating the first electron microscope. In that same year, Reinhold Rudenberg, the scientific director of the Siemens company, patented an electrostatic lens electron microscope.^{[4][7]}

Improving resolution

At the time, electrons were understood to be charged particles of matter; the wave nature of electrons was not fully realized until the publication of the De Broglie hypothesis in 1927.^[8] The research group was unaware of this publication until 1932, when they quickly realized that the De Broglie wavelength of electrons was many orders of magnitude smaller than that for light, theoretically allowing for imaging at atomic scales. In April 1932, Ruska suggested the construction of a new electron microscope for direct imaging of specimens inserted into the microscope, rather than simple mesh grids or images of apertures. With this device successful diffraction and normal imaging of an aluminium sheet was achieved. However the magnification achievable

was lower than with light microscopy. Magnifications higher than those available with a light microscope were achieved in September 1933 with images of cotton fibers quickly acquired before being damaged by the electron beam.^[4]

At this time, interest in the electron microscope had increased, with other groups, such as Paul Anderson and Kenneth Fitzsimmons of Washington State University,^[9] and Albert Prebus and James Hillier at the University of Toronto, who constructed the first TEMs in North America in 1935 and 1938, respectively,^[10] continually advancing TEM design.

Research continued on the electron microscope at Siemens in 1936, where the aim of the research was the development and improvement of TEM imaging properties, particularly with regard to biological specimens. At this time electron microscopes were being fabricated for specific groups, such as the "EM1" device used at the UK National Physical Laboratory.^[11] In 1939 the first commercial electron microscope, pictured, was installed in the Physics department of IG Farben-Werke. Further work on the electron microscope was hampered by the destruction of a new laboratory constructed at Siemens by an air-raid, as well as the death of two of the researchers, Heinz Müller and Friedrich Krause during World War II.^[12]

Further research

After World War II, Ruska resumed work at Siemens, where he continued to develop the electron microscope, producing the first microscope with 100k magnification.^[12] The fundamental structure of this microscope design, with multi-stage beam preparation optics, is still used in modern microscopes. The worldwide electron microscopy community advanced with electron microscopes being manufactured in Manchester UK, the USA (RCA), Germany (Siemens) and Japan (JEOL). The first international conference in electron microscopy was in Delft in 1949, with more than one hundred attendees.^[11] Later conferences included the "First" international conference in Paris, 1950 and then in London in 1954.

With the development of TEM, the associated technique of scanning transmission electron microscopy (STEM) was re-investigated and did not become developed until the 1970s, with Albert Crewe at the University of Chicago developing the field emission gun^[13] and adding a high quality objective lens to create the modern STEM. Using this design, Crewe demonstrated the ability to image atoms using annular dark-field imaging. Crewe and coworkers at the University of Chicago developed the cold field electron emission source and built a STEM able to visualize single heavy atoms on thin carbon substrates.^[14] In 2008, Jannick Meyer et al. described the direct visualization of light atoms such as carbon and even hydrogen using TEM and a clean single-layer graphene substrate.^[15]

Background

Electrons

Theoretically, the maximum resolution, d , that one can obtain with a light microscope has been limited by the wavelength of the photons that are being used to probe the sample, λ , and the numerical aperture of the system, NA .^[16]

$$d = \frac{\lambda}{2n \sin \alpha} \approx \frac{\lambda}{2 \text{NA}}$$

where n is the index of refraction of the medium in which the lens is working and α is the maximum half-angle of the cone of light that can enter the lens (see [numerical aperture](#)).^[17] Early twentieth century scientists theorized ways of getting around the limitations of the relatively large wavelength of visible light (wavelengths of 400–700 [nanometers](#)) by using electrons. Like all matter, electrons have both wave and particle properties (as theorized by [Louis-Victor de Broglie](#)), and their wave-like properties mean that a beam of electrons can be made to behave like a beam of electromagnetic radiation. The wavelength of electrons is related to their kinetic energy via the de Broglie equation. An additional correction must be made to account for relativistic effects, as in a TEM an electron's velocity approaches the speed of light, c .^[18]

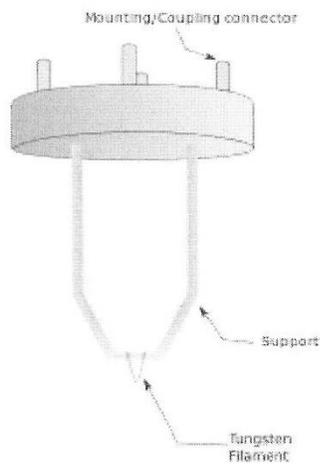
$$\lambda_e \approx \frac{h}{\sqrt{2m_0 E \left(1 + \frac{E}{2m_0 c^2}\right)}}$$

where, h is [Planck's constant](#), m_0 is the [rest mass](#) of an electron and E is the energy of the accelerated electron. Electrons are usually generated in an electron microscope by a process known as [thermionic emission](#) from a filament, usually tungsten, in the same manner as a [light bulb](#), or alternatively by [field electron emission](#).^[19] The electrons are then accelerated by an [electric potential](#) (measured in [volts](#)) and focused by electrostatic and electromagnetic lenses onto the sample. The transmitted beam contains information about electron density, phase and [periodicity](#); this beam is used to form an image.

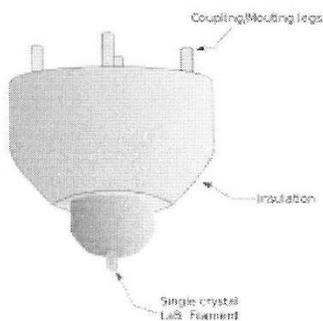
Source formation

From the top down, the TEM consists of an emission source, which may be a [tungsten filament](#) or needle, or a [lanthanum hexaboride \(LaB₆\) single crystal](#) source.^[20] The gun is connected to a high voltage source (typically ~100–300 kV) and, given sufficient current, the gun will begin to emit electrons either by [thermionic](#) or [field electron emission](#) into the vacuum. The electron source is typically mounted in a [Wehnelt cylinder](#) to provide preliminary focus of the emitted electrons into a beam. The upper lenses of the TEM then further focus the electron beam to the desired size and location.^[21]

Manipulation of the electron beam is performed using two physical effects. The interaction of electrons with a magnetic field will cause electrons to move according to the [left hand rule](#), thus allowing for [electromagnets](#) to manipulate the electron beam. The use of magnetic fields allows for the formation of a magnetic lens of variable focusing power, the lens shape originating due to the distribution of magnetic flux. Additionally, electrostatic fields can cause the electrons to be deflected through a constant angle. Coupling of two deflections in opposing directions with a small intermediate gap allows for the formation of a shift in the beam path, this being used in TEM for beam shifting, subsequently this is extremely important to [STEM](#). From these two effects, as well as the use of an electron imaging system, sufficient control over the beam path is possible for TEM operation. The optical configuration of a TEM can be rapidly changed, unlike that for an optical



Hairpin style tungsten filament

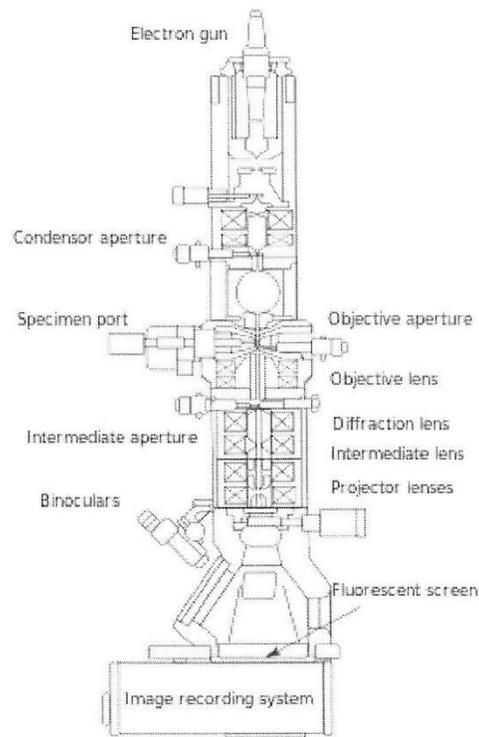


Single crystal LaB₆ filament

microscope, as lenses in the beam path can be enabled, have their strength changed, or be disabled entirely simply via rapid electrical switching, the speed of which is limited by effects such as the magnetic hysteresis of the lenses.

Optics

The lenses of a TEM allow for beam convergence, with the angle of convergence as a variable parameter, giving the TEM the ability to change magnification simply by modifying the amount of current that flows through the coil, quadrupole or hexapole lenses. The quadrupole lens is an arrangement of electromagnetic coils at the vertices of the square, enabling the generation of a lensing magnetic fields, the hexapole configuration simply enhances the lens symmetry by using six, rather than four coils.



Layout of optical components in a basic TEM

Typically a TEM consists of three stages of lensing. The stages are the condenser lenses, the objective lenses, and the projector lenses. The condenser lenses are responsible for primary beam formation, while the objective lenses focus the beam that comes through the sample itself (in STEM scanning mode, there are also objective lenses above the sample to make the incident electron beam convergent). The projector lenses are used to expand the beam onto the phosphor screen or other imaging device, such as film. The magnification of the TEM is due to the ratio of the distances between the specimen and the objective lens' image plane.^[22] Additional stigmators allow for the correction of asymmetrical beam distortions, known as astigmatism. It is noted that TEM optical configurations differ significantly with implementation, with manufacturers using custom lens configurations, such as in spherical aberration corrected instruments,^[21] or TEMs using energy filtering to correct electron chromatic aberration.

Display

Imaging systems in a TEM consist of a phosphor screen, which may be made of fine (10–100 μm) particulate zinc sulfide, for direct observation by the operator, and, optionally, an image recording system such as film based or doped YAG screen coupled CCDs.^[23] Typically these devices can be removed or inserted into the beam path by the operator as required.

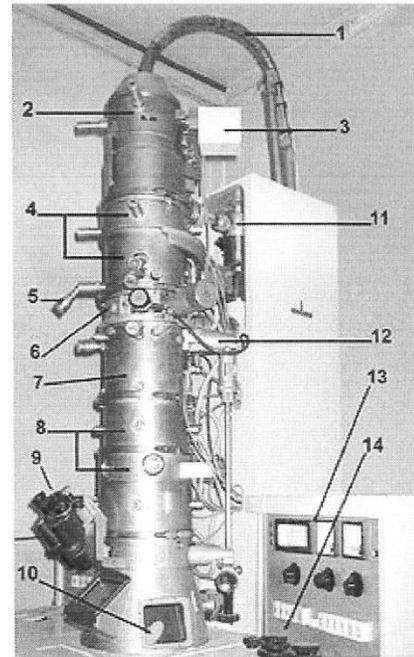
Components

A TEM is composed of several components, which include a vacuum system in which the electrons travel, an electron emission source for generation of the electron stream, a series of electromagnetic lenses, as well as electrostatic plates. The latter two allow the operator to guide and manipulate the beam as required. Also required is a device to allow the insertion into, motion within, and removal of specimens from the beam path. Imaging devices are subsequently used to create an image from the electrons that exit the system.

Vacuum system

To increase the mean free path of the electron gas interaction, a standard TEM is evacuated to low pressures, typically on the order of 10^{-4} Pa.^[24] The need for this is twofold: first the allowance for the voltage difference between the cathode and the ground without generating an arc, and secondly to reduce the collision frequency of electrons with gas atoms to negligible levels—this effect is characterized by the mean free path. TEM components such as specimen holders and film cartridges must be routinely inserted or replaced requiring a system with the ability to re-evacuate on a regular basis. As such, TEMs are equipped with multiple pumping systems and airlocks and are not permanently vacuum sealed.

The vacuum system for evacuating a TEM to an operating pressure level consists of several stages. Initially, a low or roughing vacuum is achieved with either a rotary vane pump or diaphragm pumps setting a sufficiently low pressure to allow the operation of a turbo-molecular or diffusion pump establishing high vacuum level necessary for operations. To allow for the low vacuum pump to not require continuous operation, while continually operating the turbo-molecular pumps, the vacuum side of a low-pressure pump may be connected to chambers which accommodate the exhaust gases from the turbo-molecular pump.^[25] Sections of the TEM may be isolated by the use of pressure-limiting apertures to allow for different vacuum levels in specific areas such as a higher vacuum of 10^{-4} to 10^{-7} Pa or higher in the electron gun in high-resolution or field-emission TEMs.



The electron source of the TEM is at the top, where the lensing system (4, 7 and 8) focuses the beam on the specimen and then projects it onto the viewing screen (10). The beam control is on the right (13 and 14)

High-voltage TEMs require ultra-high vacuums on the range of 10^{-7} to 10^{-9} Pa to prevent the generation of an electrical arc, particularly at the TEM cathode.^[26] As such for higher voltage TEMs a third vacuum system may operate, with the gun isolated from the main chamber either by gate valves or a differential pumping aperture – a small hole that prevents the diffusion of gas molecules into the higher vacuum gun area faster than they can be pumped out. For these very low pressures, either an ion pump or a getter material is used.

Poor vacuum in a TEM can cause several problems ranging from the deposition of gas inside the TEM onto the specimen while viewed in a process known as electron beam induced deposition to more severe cathode damages caused by electrical discharge.^[26] The use of a cold trap to adsorb sublimated gases in the vicinity of the specimen largely eliminates vacuum problems that are caused by specimen sublimation.^[25]

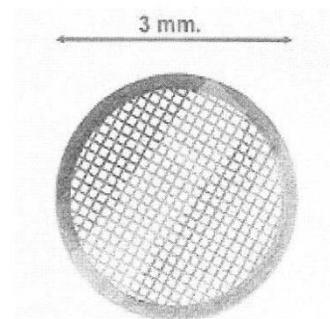
Specimen stage

TEM specimen stage designs include airlocks to allow for insertion of the specimen holder into the vacuum with minimal loss of vacuum in other areas of the microscope. The specimen holders hold a standard size of sample grid or self-supporting specimen. Standard TEM grid sizes are 3.05 mm diameter, with a thickness and mesh size ranging from a few to 100 μm . The sample is placed onto the meshed area having a diameter of approximately 2.5 mm. Usual grid materials are copper, molybdenum, gold or platinum. This grid is placed into the sample holder, which is paired with the specimen stage. A wide variety of designs of stages and holders exist, depending upon the type of experiment being performed. In addition to 3.05 mm grids, 2.3 mm grids are sometimes, if rarely, used. These grids were particularly used in the mineral sciences where a large degree of tilt can be required and where specimen material may be extremely rare.

Electron transparent specimens have a thickness usually less than 100 nm, but this value depends on the accelerating voltage.

Once inserted into a TEM, the sample has to be manipulated to locate the region of interest to the beam, such as in single grain diffraction, in a specific orientation. To accommodate this, the TEM stage allows movement of the sample in the XY plane, Z height adjustment, and commonly a single tilt direction parallel to the axis of side entry holders. Sample rotation may be available on specialized diffraction holders and stages. Some modern TEMs provide the ability for two orthogonal tilt angles of movement with specialized holder designs called double-tilt sample holders. Some stage designs, such as top-entry or vertical insertion stages once common for high resolution TEM studies, may simply only have X-Y translation available. The design criteria of TEM stages are complex, owing to the simultaneous requirements of mechanical and electron-optical constraints and specialized models are available for different methods.

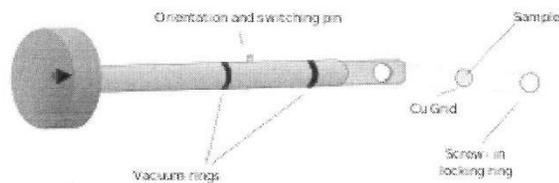
A TEM stage is required to have the ability to hold a specimen and be manipulated to bring the region of interest into the path of the electron beam. As the TEM can operate over a wide range of magnifications, the stage must simultaneously be highly resistant to mechanical drift, with drift requirements as low as a few nm/minute while being able to move several $\mu\text{m}/\text{minute}$, with repositioning accuracy on the order of



TEM sample support mesh "grid", with ultramicrotomy sections

nanometers.^[27] Earlier designs of TEM accomplished this with a complex set of mechanical downgearing devices, allowing the operator to finely control the motion of the stage by several rotating rods. Modern devices may use electrical stage designs, using screw gearing in concert with stepper motors, providing the operator with a computer-based stage input, such as a joystick or trackball.

Two main designs for stages in a TEM exist, the side-entry and top entry version.^[23] Each design must accommodate the matching holder to allow for specimen insertion without either damaging delicate TEM optics or allowing gas into TEM systems under vacuum.



A diagram of a single axis tilt sample holder for insertion into a TEM goniometer. Tilting of the holder is achieved by rotation of the entire goniometer

The most common is the side entry holder, where the specimen is placed near the tip of a long metal (brass or stainless steel) rod, with the specimen placed flat in a small bore. Along the rod are several polymer vacuum rings to allow for the formation of a vacuum seal of sufficient quality, when inserted into the stage. The stage is thus designed to accommodate the rod, placing the sample either in between or near the objective lens, dependent upon the objective design. When inserted into the stage, the side entry holder has its tip contained within the TEM vacuum, and the

base is presented to atmosphere, the airlock formed by the vacuum rings.

Insertion procedures for side-entry TEM holders typically involve the rotation of the sample to trigger micro switches that initiate evacuation of the airlock before the sample is inserted into the TEM column.

The second design is the top-entry holder consists of a cartridge that is several cm long with a bore drilled down the cartridge axis. The specimen is loaded into the bore, possibly using a small screw ring to hold the sample in place. This cartridge is inserted into an airlock with the bore perpendicular to the TEM optic axis. When sealed, the airlock is manipulated to push the cartridge such that the cartridge falls into place, where the bore hole becomes aligned with the beam axis, such that the beam travels down the cartridge bore and into the specimen. Such designs are typically unable to be tilted without blocking the beam path or interfering with the objective lens.^[23]

Electron gun

The electron gun is formed from several components: the filament, a biasing circuit, a Wehnelt cap, and an extraction anode. By connecting the filament to the negative component power supply, electrons can be "pumped" from the electron gun to the anode plate, and TEM column, thus completing the circuit. The gun is designed to create a beam of electrons exiting from the assembly at some given angle, known as the gun divergence semi-angle, α . By constructing the Wehnelt cylinder such that it has a higher negative charge than the filament itself, electrons that exit the filament in a diverging manner are, under proper operation, forced into a converging pattern the minimum size of which is the gun crossover diameter.

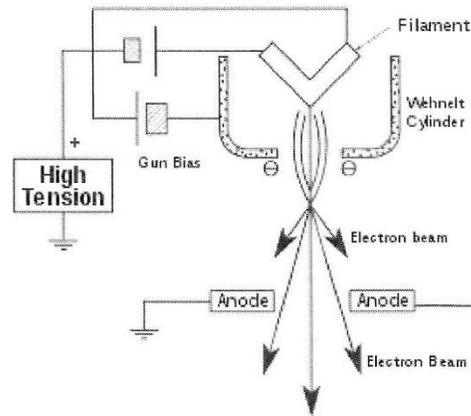
The thermionic emission current density, J , can be related to the work function of the emitting material via

Richardson's law

$$J = AT^2 \exp\left(-\frac{\Phi}{kT}\right),$$

where A is the Richardson's constant, Φ is the work function and T is the temperature of the material.^[23]

This equation shows that in order to achieve sufficient current density it is necessary to heat the emitter, taking care not to cause damage by application of excessive heat. For this reason materials with either a high melting point, such as tungsten, or those with a low work function (LaB₆) are required for the gun filament.^[28] Furthermore, both lanthanum hexaboride and tungsten thermionic sources must be heated in order to achieve thermionic emission, this can be achieved by the use of a small resistive strip. To prevent thermal shock, there is often a delay enforced in the application of current to the tip, to prevent thermal gradients from damaging the filament, the delay is usually a few seconds for LaB₆, and significantly lower for tungsten.



Cross sectional diagram of an electron gun assembly, illustrating electron extraction

Electron lens

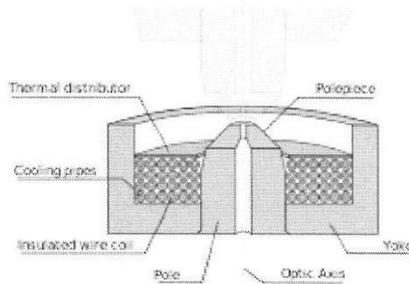


Diagram of a TEM split pole piece design lens

Electron lenses are designed to act in a manner emulating that of an optical lens, by focusing parallel electrons at some constant focal distance. Electron lenses may operate electrostatically or magnetically. The majority of electron lenses for TEM use electromagnetic coils to generate a convex lens. The field produced for the lens must be radially symmetrical, as deviation from the radial symmetry of the magnetic lens causes aberrations such as astigmatism, and worsens spherical and chromatic aberration. Electron lenses are manufactured from iron, iron-cobalt or nickel cobalt alloys,^[29] such as permalloy. These are selected for their magnetic properties, such as magnetic saturation, hysteresis and permeability.

The components include the yoke, the magnetic coil, the poles, the polepiece, and the external control circuitry. The pole piece must be manufactured in a very symmetrical manner, as this provides the boundary conditions for the magnetic field that forms the lens. Imperfections in the manufacture of the pole piece can induce severe distortions in the magnetic field symmetry, which induce distortions that will ultimately limit the lenses' ability to reproduce the object plane. The exact dimensions of the gap, pole piece internal diameter and taper, as well as the overall design of the lens is often performed by finite element analysis of the magnetic field, whilst considering the thermal and electrical constraints of the design.^[29]

The coils which produce the magnetic field are located within the lens yoke. The coils can contain a variable current, but typically use high voltages, and therefore require significant insulation in order to prevent short-circuiting the lens components. Thermal distributors are placed to ensure the extraction of the heat generated by the energy lost to resistance of the coil windings. The windings may be water-cooled, using a chilled water supply in order to facilitate the removal of the high thermal duty.

Apertures

Apertures are annular metallic plates, through which electrons that are further than a fixed distance from the optic axis may be excluded. These consist of a small metallic disc that is sufficiently thick to prevent electrons from passing through the disc, whilst permitting axial electrons. This permission of central electrons in a TEM causes two effects simultaneously: firstly, apertures decrease the beam intensity as electrons are filtered from the beam, which may be desired in the case of beam sensitive samples. Secondly, this filtering removes electrons that are scattered to high angles, which may be due to unwanted processes such as spherical or chromatic aberration, or due to diffraction from interaction within the sample.^[30]

Apertures are either a fixed aperture within the column, such as at the condenser lens, or are a movable aperture, which can be inserted or withdrawn from the beam path, or moved in the plane perpendicular to the beam path. Aperture assemblies are mechanical devices which allow for the selection of different aperture sizes, which may be used by the operator to trade off intensity and the filtering effect of the aperture. Aperture assemblies are often equipped with micrometers to move the aperture, required during optical calibration.

Imaging methods

Imaging methods in TEM use the information contained in the electron waves exiting from the sample to form an image. The projector lenses allow for the correct positioning of this electron wave distribution onto the viewing system. The observed intensity, I , of the image, assuming sufficiently high quality of imaging device, can be approximated as proportional to the time-averaged amplitude of the electron wavefunctions, where the wave that forms the exit beam is denoted by Ψ .^[31]

$$I(x) = \frac{k}{t_1 - t_0} \int_{t_0}^{t_1} \Psi \Psi^* dt$$

Different imaging methods therefore attempt to modify the electron waves exiting the sample in a way that provides information about the sample, or the beam itself. From the previous equation, it can be deduced that the observed image depends not only on the amplitude of beam, but also on the phase of the electrons, although phase effects may often be ignored at lower magnifications. Higher resolution imaging requires thinner samples and higher energies of incident electrons, which means that the sample can no longer be considered to be absorbing electrons (i.e., via a Beer's law effect). Instead, the sample can be modeled as an object that does not change the amplitude of the incoming electron wave function, but instead modifies the phase of the incoming wave; in this model, the sample is known as a pure phase object. For sufficiently thin specimens, phase effects dominate the image, complicating analysis of the observed intensities.^[31] To improve

the contrast in the image, the TEM may be operated at a slight defocus to enhance contrast, owing to convolution by the contrast transfer function of the TEM,^[32] which would normally decrease contrast if the sample was not a weak phase object.

Contrast formation

Contrast formation in the TEM depends upon the mode of operation. These different modes may be selected to discern different types of information about the specimen.

Bright field

The most common mode of operation for a TEM is the bright field imaging mode. In this mode the contrast formation comes from the sample having varying thickness or density. Thicker areas of the sample and denser areas or regions with a higher atomic number will block more electrons and appear dark in an image, while thinner, lower density, lower atomic number regions and areas with no sample in the beam path will appear bright. The term "bright field" refers to the bright background field where there is no sample and most of the beam electrons reach the image. The image is assumed to be a simple two dimensional projection of the sample's thickness and density down the optic axis, and to a first approximation may be modelled via Beer's law,^[16] more complex analyses require the modelling of the sample image to include phase information.^[31]

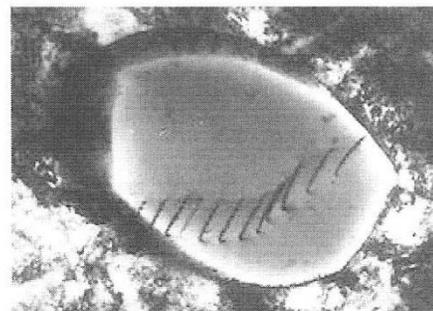
Diffraction contrast

Samples can exhibit diffraction contrast, whereby the electron beam undergoes Bragg scattering, which in the case of a crystalline sample, disperses electrons into discrete locations in the back focal plane. By the placement of apertures in the back focal plane, i.e. the objective aperture, the desired Bragg reflections can be selected (or excluded), thus only parts of the sample that are causing the electrons to scatter to the selected reflections will end up projected onto the imaging apparatus.

If the reflections that are selected do not include the unscattered beam (which will appear up at the focal point of the lens), then the image will appear dark wherever no sample scattering to the selected peak is present, as such a region without a specimen will appear dark. This is known as a dark-field image.

Modern TEMs are often equipped with specimen holders that allow the user to tilt the specimen to a range of angles in order to obtain specific diffraction conditions, and apertures placed above the specimen allow the user to select electrons that would otherwise be diffracted in a particular direction from entering the specimen.

Applications for this method include the identification of lattice defects in crystals. By carefully selecting the orientation of the sample, it is possible not just to determine the position of defects but also to determine the type of defect present. If the sample is oriented so that one particular plane is only slightly tilted away from the strongest diffracting angle (known as the Bragg Angle), any distortion of the crystal plane that locally tilts the



Transmission electron micrograph of dislocations in steel, which are faults in the structure of the crystal lattice at the atomic scale

plane to the Bragg angle will produce particularly strong contrast variations. However, defects that produce only displacement of atoms that do not tilt the crystal to the Bragg angle (i. e. displacements parallel to the crystal plane) will not produce strong contrast.^[33]

Electron energy loss

Using the advanced technique of EELS, for TEMs appropriately equipped, electrons can be rejected based upon their voltage (which, due to constant charge is their energy), using magnetic sector based devices known as EELS spectrometers. These devices allow for the selection of particular energy values, which can be associated with the way the electron has interacted with the sample. For example, different elements in a sample result in different electron energies in the beam after the sample. This normally results in chromatic aberration – however this effect can, for example, be used to generate an image which provides information on elemental composition, based upon the atomic transition during electron-electron interaction.^[34]

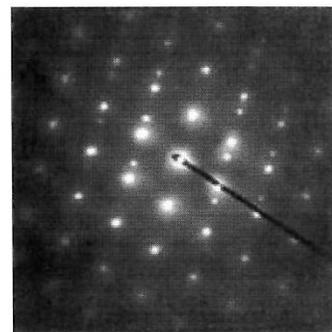
EELS spectrometers can often be operated in both spectroscopic and imaging modes, allowing for isolation or rejection of elastically scattered beams. As for many images inelastic scattering will include information that may not be of interest to the investigator thus reducing observable signals of interest, EELS imaging can be used to enhance contrast in observed images, including both bright field and diffraction, by rejecting unwanted components.

Phase contrast

Crystal structure can also be investigated by high-resolution transmission electron microscopy (HRTEM), also known as phase contrast. When using a Field emission source and a specimen of uniform thickness, the images are formed due to differences in phase of electron waves, which is caused by specimen interaction.^[32] Image formation is given by the complex modulus of the incoming electron beams. As such, the image is not only dependent on the number of electrons hitting the screen, making direct interpretation of phase contrast images more complex. However this effect can be used to an advantage, as it can be manipulated to provide more information about the sample, such as in complex phase retrieval techniques.

Diffraction

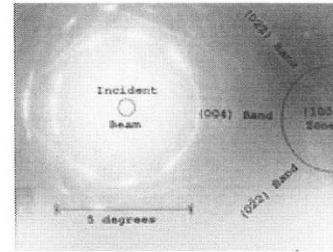
As previously stated, by adjusting the magnetic lenses such that the back focal plane of the lens rather than the imaging plane is placed on the imaging apparatus a diffraction pattern can be generated. For thin crystalline samples, this produces an image that consists of a pattern of dots in the case of a single crystal, or a series of rings in the case of a polycrystalline or amorphous solid material. For the single crystal case the diffraction pattern is dependent upon the orientation of the specimen and the structure of the sample illuminated by the electron beam. This image provides the investigator with information about the space group symmetries in the crystal and the crystal's orientation to the beam path. This is typically done without using any information but the position at which the diffraction spots appear and the observed image symmetries.



Crystalline diffraction pattern from a twinned grain of FCC Austenitic steel

Diffraction patterns can have a large dynamic range, and for crystalline samples, may have intensities greater than those recordable by CCD. As such, TEMs may still be equipped with film cartridges for the purpose of obtaining these images, as the film is a single use detector.

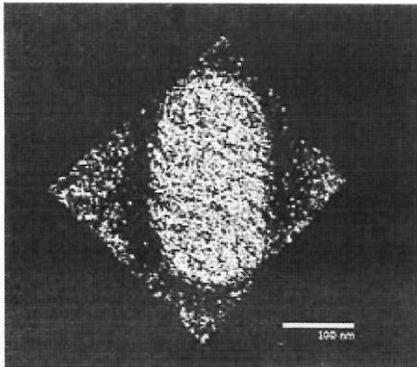
Analysis of diffraction patterns beyond point-position can be complex, as the image is sensitive to a number of factors such as specimen thickness and orientation, objective lens defocus, spherical and chromatic aberration. Although quantitative interpretation of the contrast shown in lattice images is possible, it is inherently complicated and can require extensive computer simulation and analysis, such as electron multislice analysis.^[35]



Convergent-beam Kikuchi lines from silicon, near the [100] zone axis

More complex behaviour in the diffraction plane is also possible, with phenomena such as Kikuchi lines arising from multiple diffraction within the crystalline lattice. In convergent beam electron diffraction (CBED) where a non-parallel, i.e. converging, electron wavefront is produced by concentrating the electron beam into a fine probe at the sample surface, the interaction of the convergent beam can provide information beyond structural data such as sample thickness.

Three-dimensional imaging



A three-dimensional TEM image of a parapoxvirus^[36]

As TEM specimen holders typically allow for the rotation of a sample by a desired angle, multiple views of the same specimen can be obtained by rotating the angle of the sample along an axis perpendicular to the beam. By taking multiple images of a single TEM sample at differing angles, typically in 1° increments, a set of images known as a "tilt series" can be collected. This methodology was proposed in the 1970s by Walter Hoppe. Under purely absorption contrast conditions, this set of images can be used to construct a three-dimensional representation of the sample.^[37]

The reconstruction is accomplished by a two-step process, first images are aligned to account for errors in the positioning of a sample; such errors can occur due to vibration or mechanical drift.

^[38] Alignment methods use image registration algorithms, such as autocorrelation methods to correct these errors. Secondly, using a reconstruction algorithm, such as filtered back projection, the aligned image slices can be transformed from a set of two-dimensional images, $I_j(x, y)$, to a single three-dimensional image, $I_j(x, y, z)$. This three-dimensional image is of particular interest when morphological information is required, further study can be undertaken using computer algorithms, such as isosurfaces and data slicing to analyse the data.

As TEM samples cannot typically be viewed at a full 180° rotation, the observed images typically suffer from a "missing wedge" of data, which when using Fourier-based back projection methods decreases the range of resolvable frequencies in the three-dimensional reconstruction.^[37] Mechanical refinements, such as multi-axis

tilting (two tilt series of the same specimen made at orthogonal directions) and conical tomography (where the specimen is first tilted to a given fixed angle and then imaged at equal angular rotational increments through one complete rotation in the plane of the specimen grid) can be used to limit the impact of the missing data on the observed specimen morphology. Using focused ion beam milling, a new technique has been proposed^[39] which uses pillar-shaped specimen and a dedicated on-axis tomography holder to perform 180° rotation of the sample inside the pole piece of the objective lens in TEM. Using such arrangements, quantitative electron tomography without the missing wedge is possible.^[40] In addition, numerical techniques exist which can improve the collected data.

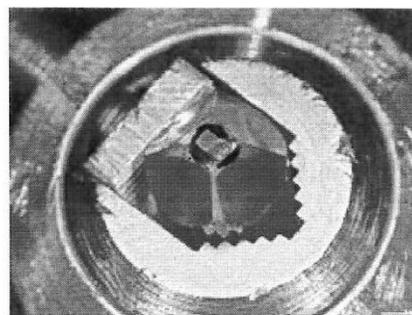
All the above-mentioned methods involve recording tilt series of a given specimen field. This inevitably results in the summation of a high dose of reactive electrons through the sample and the accompanying destruction of fine detail during recording. The technique of low-dose (minimal-dose) imaging is therefore regularly applied to mitigate this effect. Low-dose imaging is performed by deflecting illumination and imaging regions simultaneously away from the optical axis to image an adjacent region to the area to be recorded (the high-dose region). This area is maintained centered during tilting and refocused before recording. During recording the deflections are removed so that the area of interest is exposed to the electron beam only for the duration required for imaging. An improvement of this technique (for objects resting on a sloping substrate film) is to have two symmetrical off-axis regions for focusing followed by setting focus to the average of the two high-dose focus values before recording the low-dose area of interest.

Non-tomographic variants on this method, referred to as single particle analysis, use images of multiple (hopefully) identical objects at different orientations to produce the image data required for three-dimensional reconstruction. If the objects do not have significant preferred orientations, this method does not suffer from the missing data wedge (or cone) which accompany tomographic methods nor does it incur excessive radiation dosage, however it assumes that the different objects imaged can be treated as if the 3D data generated from them arose from a single stable object.

Sample preparation

Sample preparation in TEM can be a complex procedure.^[41] TEM specimens should be less than 100 nanometers thick for a conventional TEM. Unlike neutron or X-Ray radiation the electrons in the beam interact readily with the sample, an effect that increases roughly with atomic number squared (z^2).^[16] High quality samples will have a thickness that is comparable to the mean free path of the electrons that travel through the samples, which may be only a few tens of nanometers. Preparation of TEM specimens is specific to the material under analysis and the type of information to be obtained from the specimen.

Materials that have dimensions small enough to be electron transparent, such as powdered substances, small organisms, viruses, or nanotubes, can be quickly prepared by the deposition of a dilute sample containing the specimen onto films on support grids. Biological specimens may be embedded

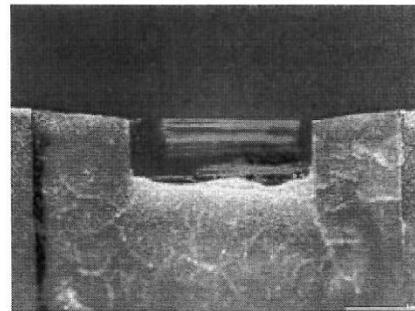


A sample of cells (black) stained with osmium tetroxide and uranyl acetate embedded in epoxy resin (amber) ready for sectioning.

in resin to withstand the high vacuum in the sample chamber and to enable cutting tissue into electron transparent thin sections. The biological sample can be stained using either a negative staining material such as uranyl acetate for bacteria and viruses, or, in the case of embedded sections, the specimen may be stained with heavy metals, including osmium tetroxide. Alternately samples may be held at liquid nitrogen temperatures after embedding in vitreous ice.^[42] In material science and metallurgy the specimens can usually withstand the high vacuum, but still must be prepared as a thin foil, or etched so some portion of the specimen is thin enough for the beam to penetrate. Constraints on the thickness of the material may be limited by the scattering cross-section of the atoms from which the material is comprised.

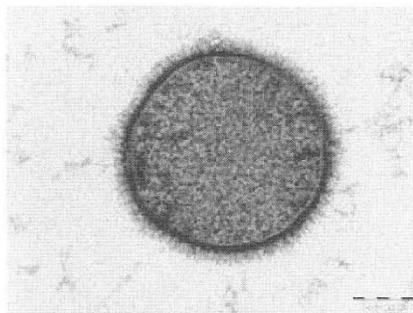
Tissue sectioning

Biological tissue is often embedded in a resin block then thinned to less than 100nm on an ultramicrotome. The resin block is fractured as it passes over a glass or diamond knife edge.^[43] This method is used to obtain thin, minimally deformed samples that allow for the observation of tissue ultrastructure. Inorganic samples, such as aluminium, may also be embedded in resins and ultrathin sectioned in this way, using either coated glass, sapphire or larger angle diamond knives.^[44] To prevent charge build-up at the sample surface when viewing in the TEM, tissue samples need to be coated with a thin layer of conducting material, such as carbon.



A diamond knife blade used for cutting ultrathin sections (typically 70 to 350 nm) for transmission electron microscopy.

Sample staining



A section of a cell of *Bacillus subtilis*, taken with a Tecnai T-12 TEM. The scale bar is 200 nm.

TEM samples of biological tissues need high atomic number stains to enhance contrast. The stain absorbs the beam electrons or scatters part of the electron beam which otherwise is projected onto the imaging system. Compounds of heavy metals such as osmium, lead, uranium or gold (in immunogold labelling) may be used prior to TEM observation to selectively deposit electron dense atoms in or on the sample in desired cellular or protein region. This process requires an understanding of how heavy metals bind to specific biological tissues and cellular structures.^[45]

Mechanical milling

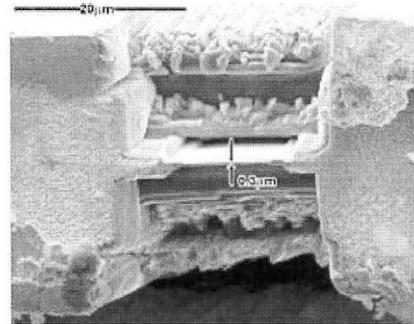
Mechanical polishing is also used to prepare samples for imaging on the TEM. Polishing needs to be done to a high quality, to ensure constant sample thickness across the region of interest. A diamond, or cubic boron nitride polishing compound may be used in the final stages of polishing to remove any scratches that may cause contrast fluctuations due to varying sample thickness. Even after careful mechanical milling, additional fine methods such as ion etching may be required to perform final stage thinning.

Chemical etching

Certain samples may be prepared by chemical etching, particularly metallic specimens. These samples are thinned using a chemical etchant, such as an acid, to prepare the sample for TEM observation. Devices to control the thinning process may allow the operator to control either the voltage or current passing through the specimen, and may include systems to detect when the sample has been thinned to a sufficient level of optical transparency.

Ion etching

Ion etching is a sputtering process that can remove very fine quantities of material. This is used to perform a finishing polish of specimens polished by other means. Ion etching uses an inert gas passed through an electric field to generate a plasma stream that is directed to the sample surface. Acceleration energies for gases such as argon are typically a few kilovolts. The sample may be rotated to promote even polishing of the sample surface. The sputtering rate of such methods is on the order of tens of micrometers per hour, limiting the method to only extremely fine polishing.



SEM image of a thin TEM sample milled by FIB. The thin membrane shown here is suitable for TEM examination; however, at ~300-nm thickness, it would not be suitable for high-resolution TEM without further milling.

Ion etching by argon gas has been recently shown to be able to file down MTJ stack structures to a specific layer which has then been atomically resolved. The TEM images taken in plan view rather than cross-section reveal that the MgO layer within MTJs contains a large number of grain boundaries that may be diminishing the properties of devices.^[46]

Ion milling

More recently focused ion beam methods have been used to prepare samples. FIB is a relatively new technique to prepare thin samples for TEM examination from larger specimens. Because FIB can be used to micro-machine samples very precisely, it is possible to mill very thin membranes from a specific area of interest in a sample, such as a semiconductor or metal. Unlike inert gas ion sputtering, FIB makes use of significantly more energetic gallium ions and may alter the composition or structure of the material through gallium implantation.^[47]

Replication

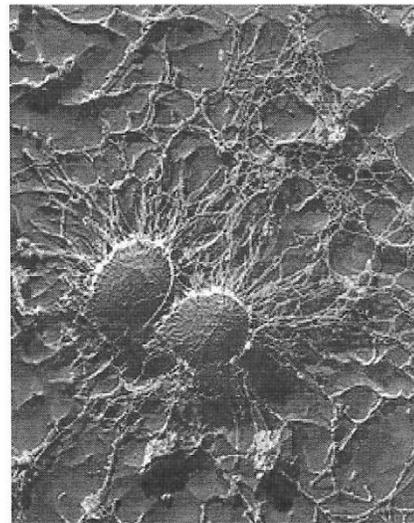
Samples may also be replicated using cellulose acetate film, the film subsequently coated with a heavy metal such as platinum, the original film dissolved away, and the replica imaged on the TEM. Variations of the replica technique are used for both materials and biological samples. In materials science a common use is for examining the fresh fracture surface of metal alloys.

Modifications

The capabilities of the TEM can be further extended by additional stages and detectors, sometimes incorporated on the same microscope.

Scanning TEM

A TEM can be modified into a scanning transmission electron microscope (STEM) by the addition of a system that rasters the beam across the sample to form the image, combined with suitable detectors. Scanning coils are used to deflect the beam, such as by an electrostatic shift of the beam, where the beam is then collected using a current detector such as a Faraday cup, which acts as a direct electron counter. By correlating the electron count to the position of the scanning beam (known as the "probe"), the transmitted component of the beam may be measured. The non-transmitted components may be obtained either by beam tilting or by the use of annular dark field detectors.



Staphylococcus aureus platinum replica image shot on a TEM at 50,000x magnification

Low-voltage electron microscope

A low-voltage electron microscope (LVEM) is operated at relatively low electron accelerating voltage between 5–25 kV. Some of these can be a combination of SEM, TEM and STEM in a single compact instrument. Low voltage increases image contrast which is especially important for biological specimens. This increase in contrast significantly reduces, or even eliminates the need to stain. Resolutions of a few nm are possible in TEM, SEM and STEM modes. The low energy of the electron beam means that permanent magnets can be used as lenses and thus a miniature column that does not require cooling can be used.^{[48][49]}

Cryo-TEM

Main article: Cryo-electron microscopy

Cryogenic transmission electron microscopy (Cryo-TEM) uses a TEM with a specimen holder capable of maintaining the specimen at liquid nitrogen or liquid helium temperatures. This allows imaging specimens prepared in vitreous ice, the preferred preparation technique for imaging individual molecules or macromolecular assemblies,^[50] imaging of vitrified solid-electrolyte interfaces,^[51] and imaging of materials that are volatile in high vacuum at room temperature, such as sulfur.^[52]

Environmental/In-situ TEM

In-situ experiments may also be conducted in TEM using differentially pumped sample chambers, or specialized holders.^[53] Types of in-situ experiments include studying nanomaterials, biological specimens, and chemical reactions using liquid-phase electron microscopy^{[54][55]}, and material deformation testing.^[56]

Aberration Corrected TEM

Modern research TEMs may include aberration correctors,^[21] to reduce the amount of distortion in the image. Incident beam monochromators may also be used which reduce the energy spread of the incident electron beam to less than 0.15 eV.^[21] Major aberration corrected TEM manufacturers include JEOL, Hitachi High-technologies, FEI Company, and NION.

Limitations

There are a number of drawbacks to the TEM technique. Many materials require extensive sample preparation to produce a sample thin enough to be electron transparent, which makes TEM analysis a relatively time consuming process with a low throughput of samples. The structure of the sample may also be changed during the preparation process. Also the field of view is relatively small, raising the possibility that the region analyzed may not be characteristic of the whole sample. There is potential that the sample may be damaged by the electron beam, particularly in the case of biological materials.

Resolution limits

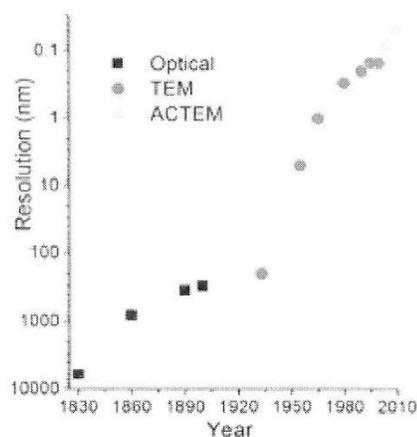
The limit of resolution obtainable in a TEM may be described in several ways, and is typically referred to as the information limit of the microscope. One commonly used value is a cut-off value of the contrast transfer function, a function that is usually quoted in the frequency domain to define the reproduction of spatial frequencies of objects in the object plane by the microscope optics. A cut-off frequency, q_{\max} , for the transfer function may be approximated with the following equation, where C_s is the spherical aberration coefficient and λ is the electron wavelength:^[30]

$$q_{\max} = \frac{1}{0.67(C_s \lambda^3)^{1/4}}.$$

For a 200 kV microscope, with partly corrected spherical aberrations ("to the third order") and a C_s value of $1 \mu\text{m}$,^[58] a theoretical cut-off value might be $1/q_{\max} = 42 \text{ pm}$.^[30] The same microscope without a corrector would have $C_s = 0.5 \text{ mm}$ and thus a 200-pm cut-off.^[58] The spherical aberrations are suppressed to the third or fifth order in the "aberration-corrected" microscopes. Their resolution is however limited by electron source geometry and brightness and chromatic aberrations in the objective lens system.^{[21][59]}

The frequency domain representation of the contrast transfer function may often have an oscillatory nature,^[60] which can be tuned by adjusting the focal value of the objective lens. This oscillatory nature implies that some spatial frequencies are faithfully imaged by the microscope, whilst others are suppressed. By combining multiple images with different spatial frequencies, the use of techniques such as focal series reconstruction can be used to improve the resolution of the TEM in a limited manner.^[30] The contrast transfer function can, to some extent, be experimentally approximated through techniques such as Fourier transforming images of amorphous material, such as amorphous carbon.

More recently, advances in aberration corrector design have been able to reduce spherical aberrations^[61] and to achieve resolution below 0.5 \AA (50 pm)^[59] at magnifications above 50 million times.^[62] Improved resolution allows for the imaging of lighter atoms that scatter electrons less efficiently, such as lithium atoms in lithium battery materials.^[63] The ability to determine the position of atoms within materials has made the HRTEM an indispensable tool for nanotechnology research and development in many fields, including heterogeneous catalysis and the development of semiconductor devices for electronics and photonics.^[64]



Evolution of spatial resolution achieved with optical, transmission (TEM) and aberration-corrected electron microscopes (ACTEM).^[57]

See also

- [Applications for electron microscopy](#)
- [Cryo-electron microscopy](#)
- [Electron beam induced deposition](#)
- [Electron diffraction](#)
- [Electron energy loss spectroscopy \(EELS\)](#)
- [Electron microscope](#)
- [Energy filtered transmission electron microscopy \(EFTEM\)](#)
- [High-resolution transmission electron microscopy \(HRTEM\)](#)
- [Low-voltage electron microscopy \(LVEM\)](#)

- [Precession Electron Diffraction](#)
- [Scanning confocal electron microscopy](#)
- [Scanning electron microscope \(SEM\)](#)
- [Scanning transmission electron microscope \(STEM\)](#)
- [Transmission Electron Aberration-corrected Microscope](#)

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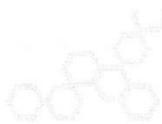
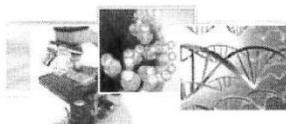
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- Cambridge University Teaching and Learning Package on TEM (<http://www.msm.cam.ac.uk/doitpoms/tlplib/tem/index.php>)
- Online course on *Transmission Electron Microscopy and Crystalline Imperfections* (<http://nanohub.org/resources/4092>) Dr. Eric Stach (2008).
- Transmission electron microscope simulator (<http://tem-simulator.goldzoneweb.info/>) (Teaching tool).
- animations and explanations on various types of microscopes including electron microscopes (<http://toutestquantique.fr/en/microscopy/>) (Université Paris Sud)

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This page was last edited on 27 October 2017, at 06:16.

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APPENDIX “E”



[Periodic Table](#) -> Magnesium

Magnesium

Magnesium Details

Magnesium Symbol: Mg

Magnesium Atomic Number: 12

Magnesium Atomic Weight: 24.312

What is Magnesium?



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▶ **Magnesium** is a well-known chemical element under number 12 in the periodic table. It goes by the symbol Mg and is one of the elements that are most frequently found in the Earth's crust, and indeed in the whole universe. It makes up 13 percent of the Earth's mass. Its abundance is owed to its easy accumulation in supernova stars. Mg is highly soluble in water, which is why it is one of the most abundant elements that can be dissolved.

Magnesium is found in significant quantities in different minerals, such as serpentine, olivine, magnetite, dolomite, and others. It is the 3rd most abundant element in the earth's crust, after iron and aluminum, and is also found in salty layers, underground brines, and seawater.

The major world supplier of magnesium is the US, supplying about 45 percent of it globally. Magnesite and dolomite are mined, with quantities reaching 10 million tonnes annually, in countries such as Greece, Russia, Austria, Slovakia, North Korea, Turkey, and China. Mg is generated mainly by obtaining magnesium salts from brine and undergoing electrolysis.

Magnesium does not occur naturally as a free element, being extremely reactive. As a free metal, it burns with a bright white light. Its reactivity is partly concealed because it is covered with a layer of oxide following production.

The compounds of this element usually have the appearance of white crystals. A great deal of them is soluble in water. Mg has three stable isotopes - 24Mg, 25Mg, and 26Mg. The majority of magnesium is in the form of the first isotope.

The element is light and silvery-white in color. Its strong reaction with water makes it useful in that it can power a magnesium-based engine. It also reacts with hydrochloric acid and other acids. There is a subsequent release of hydrogen gas. Mg is extremely flammable, but not in large quantities. If it starts to burn though, it is very hard to put out. This is because it can burn in nitrogen, water, and carbon dioxide, forming different chemical compounds with all of these. The only way to deal with a magnesium fire is to smother it under dry sand to break off all contact with the atmosphere.

In the early years of photography, magnesium was used as a source of light. This was because of the brilliant light it gives off when burning in air. Today, the element is used to produce fireworks and marine flares. It reaches very high temperatures when burning, up to 3,100 °C. The main use of this element is in aluminum-magnesium alloys. The element is commonly used in fertilizers, laxatives, for nerve stabilization, and the treatment of spasms of blood vessels (as an element in certain types of medications).

The element is sour, making it useful to improve the taste of mineral water in low amounts. It makes up a large part of the human body as well, with vital ions. Magnesium plays a vital role in the formation of DNA too. Humans need at least 200 mg of magnesium and can take up to 350 mg a day. The human body deals quite efficiently with magnesium - it recycles excessive amounts and takes it from food whenever contained in it. Persistent intake of high amounts, however, may result in confusion, lethargy, and muscle weakness.

Mg

Magnesium

Phase: Solid
Category: Alkali Earth Metals
Atomic Number: 12

1 MAYA Elemental Analyser

Real-time chemical analysis laser-distance-spectrometry.com



2 pH Theory Guide

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APPENDIX “F”

APPENDIX “G”

“If an injury must be done to a man, it should be so severe that his vengeance not - need not be feared”, the prints [*sic*: “The Prince”], my new bible. You’ve seen what happens when I fuck up and trust people.”

(RP 2754, ll. 20-23)

“I’m sorry. It’s just that if you walked away, you would have suitors lined up and I would have nothing to show for the last twelve years.”

(RP 2759, ll. 1-9)

“Unfortunately for them, my enemies don’t - didn’t put be [*sic*] down and out when they had the chance -- when they had chances. Now it’s time to build an empire capable of

burning them to the ground.” “No phoenix scenarios, no quarter, no remorse.”

(RP 2759, ll. 13-18)

“Why do you think I’m angry with you? You’re the only reason I’m still alive. I can count on both hands the number of Americans I don’t hate. Without you I would have left this shit hole years ago and not looked back.”

(RP 2759, l. 22 to RP 2760, l. 3)

“You need to pull your head out of your ass if we’re going to make it through this. You’re using the same manipulative tactics that my ex did. I’m sick of everyone telling -- trying to tell me how to run a marriage and being nagged, micro .../micromanaged. Tonight off? Great. It just starts all over again tomorrow.”

And now I have to deal with Terry trying to impact his pacifist wisdom on me.”

(RP 2761, l. 3; ll. 13-22)

To be frank, I'd rather get you away from any and all cackling hens, bible thumpers, and anyone -- everyone else who seems to think if they quote a little more scripture it will somehow make me have an epiphany, that I need to conform. Your close associates seem to influence you to say and do condescending and emasculating shit. Ex -- and in parentheses, exponentially bad as of late, end parentheses. Then all the while I just sit there and take it because if I react appropriately I'm in for a path of -- scripture-based lecture about my temper, how I need to respect my wife, accept Jesus into my heart, et cetera, especially when your grandma is around.

(RP 2762, ll. 13-24)

APPENDIX “H”

THE COURT: The Court heard argument yesterday regarding -- and I don't know if this is a mischaracterization or not; if it is, I apologize, but it's what I'm going to call it -- more or less a hit list, whether it was written or unwritten. And the issue is whether or not that can be brought up in Ms. Constable's testimony to show fear.

The State wants to introduce that testimony through Ms. Constable. And the testimony more specifically is that Mr. Murry kept either what is written or unwritten as what I'll describe as a hit list.

The State seeks to introduce that testimony to show that Ms. Constable was afraid to bring up the divorce, as she thought that

she'd be placed on that list if she were to bring up the divorce.

The State wants this evidence introduced to show that Ms. Constable -- for her state of mind. Her state of mind is relevant for the limited purpose of establishing why she was afraid to bring up a divorce with Mr. Murry. The issue of divorce is also relevant, as it goes to the *res gestae* of the State's case.

Although it is relevant, evidence can be excluded if the probative value is outweighed by the prejudicial effect. Here, introducing evidence that Mr. Murry had what I'll describe once again as a hit list, whether written or unwritten, would prove to be more prejudicial than probative, especially considering the nature of the offenses for which he's charged.

So Ms. Constable may testify about what loyalty means or breach of loyalty as

she's witness to Mr. Murry, but any statements regarding once again what I'll describe as a hit list would be unduly prejudicial, especially given the nature of the charges and that prejudicial effect outweighs the probative value. So she will be precluded from discussing that list. But she may discuss other issues that cause her state of mind to be fearful of Mr. Murry.

(RP 2730, l. 5 to RP 2731, l. 16)

APPENDIX “I”

cause these conditions may have cross-sectional symptom features that mimic personality traits and may make it more difficult to evaluate retrospectively the individual's long-term patterns of functioning.

Posttraumatic stress disorder. When personality changes emerge and persist after an individual has been exposed to extreme stress, a diagnosis of posttraumatic stress disorder should be considered.

Substance use disorders. When an individual has a substance use disorder, it is important not to make a personality disorder diagnosis based solely on behaviors that are consequences of substance intoxication or withdrawal or that are associated with activities in the service of sustaining substance use (e.g., antisocial behavior).

Personality change due to another medical condition. When enduring changes in personality arise as a result of the physiological effects of another medical condition (e.g., brain tumor), a diagnosis of personality change due to another medical condition should be considered.

Cluster A Personality Disorders

Paranoid Personality Disorder

Diagnostic Criteria

301.0 (F60.0)

- A. A pervasive distrust and suspiciousness of others such that their motives are interpreted as malevolent, beginning by early adulthood and present in a variety of contexts, as indicated by four (or more) of the following:
1. Suspects, without sufficient basis, that others are exploiting, harming, or deceiving him or her.
 2. Is preoccupied with unjustified doubts about the loyalty or trustworthiness of friends or associates.
 3. Is reluctant to confide in others because of unwarranted fear that the information will be used maliciously against him or her.
 4. Reads hidden demeaning or threatening meanings into benign remarks or events.
 5. Persistently bears grudges (i.e., is unforgiving of insults, injuries, or slights).
 6. Perceives attacks on his or her character or reputation that are not apparent to others and is quick to react angrily or to counterattack.
 7. Has recurrent suspicions, without justification, regarding fidelity of spouse or sexual partner.
- B. Does not occur exclusively during the course of schizophrenia, a bipolar disorder or depressive disorder with psychotic features, or another psychotic disorder and is not attributable to the physiological effects of another medical condition.

Note: If criteria are met prior to the onset of schizophrenia, add "premorbid," i.e., "paranoid personality disorder (premorbid)."

Diagnostic Features

The essential feature of paranoid personality disorder is a pattern of pervasive distrust and suspiciousness of others such that their motives are interpreted as malevolent. This pattern begins by early adulthood and is present in a variety of contexts.

Individuals with this disorder assume that other people will exploit, harm, or deceive them, even if no evidence exists to support this expectation (Criterion A1). They suspect on the basis of little or no evidence that others are plotting against them and may attack them suddenly, at any time and without reason. They often feel that they have been deeply and irreversibly injured by another person or persons even when there is no objective evidence for this. They are preoccupied with unjustified doubts about the loyalty or trustworthiness of their friends and associates, whose actions are minutely scrutinized for evidence of hostile intentions (Criterion A2). Any perceived deviation from trustworthiness or loyalty serves to support their underlying assumptions. They are so amazed when a friend or associate shows loyalty that they cannot trust or believe it. If they get into trouble, they expect that friends and associates will either attack or ignore them.

Individuals with paranoid personality disorder are reluctant to confide in or become close to others because they fear that the information they share will be used against them (Criterion A3). They may refuse to answer personal questions, saying that the information is "nobody's business." They read hidden meanings that are demeaning and threatening into benign remarks or events (Criterion A4). For example, an individual with this disorder may misinterpret an honest mistake by a store clerk as a deliberate attempt to short-change, or view a casual humorous remark by a co-worker as a serious character attack. Compliments are often misinterpreted (e.g., a compliment on a new acquisition is misinterpreted as a criticism for selfishness; a compliment on an accomplishment is misinterpreted as an attempt to coerce more and better performance). They may view an offer of help as a criticism that they are not doing well enough on their own.

Individuals with this disorder persistently bear grudges and are unwilling to forgive the insults, injuries, or slights that they think they have received (Criterion A5). Minor slights arouse major hostility, and the hostile feelings persist for a long time. Because they are constantly vigilant to the harmful intentions of others, they very often feel that their character or reputation has been attacked or that they have been slighted in some other way. They are quick to counterattack and react with anger to perceived insults (Criterion A6). Individuals with this disorder may be pathologically jealous, often suspecting that their spouse or sexual partner is unfaithful without any adequate justification (Criterion A7). They may gather trivial and circumstantial "evidence" to support their jealous beliefs. They want to maintain complete control of intimate relationships to avoid being betrayed and may constantly question and challenge the whereabouts, actions, intentions, and fidelity of their spouse or partner.

Paranoid personality disorder should not be diagnosed if the pattern of behavior occurs exclusively during the course of schizophrenia, a bipolar disorder or depressive disorder with psychotic features, or another psychotic disorder, or if it is attributable to the physiological effects of a neurological (e.g., temporal lobe epilepsy) or another medical condition (Criterion B).

Associated Features Supporting Diagnosis

Individuals with paranoid personality disorder are generally difficult to get along with and often have problems with close relationships. Their excessive suspiciousness and hostility may be expressed in overt argumentativeness, in recurrent complaining, or by quiet, apparently hostile aloofness. Because they are hypervigilant for potential threats, they may act in a guarded, secretive, or devious manner and appear to be "cold" and lacking in tender feelings. Although they may appear to be objective, rational, and unemotional, they more often display a labile range of affect, with hostile, stubborn, and sarcastic expressions predominating. Their combative and suspicious nature may elicit a hostile response in others, which then serves to confirm their original expectations.

Because individuals with paranoid personality disorder lack trust in others, they have an excessive need to be self-sufficient and a strong sense of autonomy. They also need to

have a high degree of control over those around them. They are often rigid, critical of others, and unable to collaborate, although they have great difficulty accepting criticism themselves. They may blame others for their own shortcomings. Because of their quickness to counterattack in response to the threats they perceive around them, they may be litigious and frequently become involved in legal disputes. Individuals with this disorder seek to confirm their preconceived negative notions regarding people or situations they encounter, attributing malevolent motivations to others that are projections of their own fears. They may exhibit thinly hidden, unrealistic grandiose fantasies, are often attuned to issues of power and rank, and tend to develop negative stereotypes of others, particularly those from population groups distinct from their own. Attracted by simplistic formulations of the world, they are often wary of ambiguous situations. They may be perceived as "fanatics" and form tightly knit "cults" or groups with others who share their paranoid belief systems.

Particularly in response to stress, individuals with this disorder may experience very brief psychotic episodes (lasting minutes to hours). In some instances, paranoid personality disorder may appear as the premorbid antecedent of delusional disorder or schizophrenia. Individuals with paranoid personality disorder may develop major depressive disorder and may be at increased risk for agoraphobia and obsessive-compulsive disorder. Alcohol and other substance use disorders frequently occur. The most common co-occurring personality disorders appear to be schizotypal, schizoid, narcissistic, avoidant, and borderline.

Prevalence

A prevalence estimate for paranoid personality based on a probability subsample from Part II of the National Comorbidity Survey Replication suggests a prevalence of 2.3%, while the National Epidemiologic Survey on Alcohol and Related Conditions data suggest a prevalence of paranoid personality disorder of 4.4%.

Development and Course

Paranoid personality disorder may be first apparent in childhood and adolescence with solitariness, poor peer relationships, social anxiety, underachievement in school, hypersensitivity, peculiar thoughts and language, and idiosyncratic fantasies. These children may appear to be "odd" or "eccentric" and attract teasing. In clinical samples, this disorder appears to be more commonly diagnosed in males.

Risk and Prognostic Factors

Genetic and physiological. There is some evidence for an increased prevalence of paranoid personality disorder in relatives of probands with schizophrenia and for a more specific familial relationship with delusional disorder, persecutory type.

Culture-Related Diagnostic Issues

Some behaviors that are influenced by sociocultural contexts or specific life circumstances may be erroneously labeled paranoid and may even be reinforced by the process of clinical evaluation. Members of minority groups, immigrants, political and economic refugees, or individuals of different ethnic backgrounds may display guarded or defensive behaviors because of unfamiliarity (e.g., language barriers or lack of knowledge of rules and regulations) or in response to the perceived neglect or indifference of the majority society. These behaviors can, in turn, generate anger and frustration in those who deal with these individuals, thus setting up a vicious cycle of mutual mistrust, which should not be confused with paranoid personality disorder. Some ethnic groups also display culturally related behaviors that can be misinterpreted as paranoid.

APPENDIX “J”

Q. Okay. And so you got your known sample and you tested it with the same possess [sic] that you tested the crime scene cartridges, right?

A. Yes.

Q. And you'd found the particles had similar elemental composition?

A. Yes.

Q. In that they had magnesium silicone, right?

A. Silicon, yes.

Q. Did I say it wrong?

A. Silicone is different than silicon.

Q. Oh, silicon. I'm sorry.

And then -- but the difference, I guess, was that the test-fired cartridges had lead associated with the magnesium silicon?

A. That's correct.

Q. Okay. And the cartridges from the crime scene, out of all of those that had any magnesium silicon particles, none of those were associated with lead?

A. Right. And to be clear what we're talking about is the magnesium silicon particles from the test firings where we purposely put the lubricant, those magnesium silicon particles had lead associated with them, not as a separate particle but with the magnesium silicon particles. And the particles from the crime scene, there were lead particles present in some of the samples we looked at, but those lead particles were separate particles. They were not associated with the magnesium silicon particles.

Q. Can you explain what it means to have a particle associated, a lead particle associated with the magnesium silicon particle?

A. Yeah. Earlier when I talked about the aciniform particles, the magnesium silicon

particles from the lubricant that looked like a -- a head of broccoli, when we focus on that head of broccoli with TEM, put the electron beam -- narrow the beam down and just blast that head of broccoli and collect the x-rays, we see the magnesium, the silicon, the aluminum, and lead that were associated with that head of broccoli, not over here by itself.

Q. Okay. And that was a difference in the cartridges found at the crime scene?

A. The lead -- we didn't see the lead associated with that head of broccoli from the crime scene cartridges.

Q. Right. So that was different --

A. Yes.

Q. -- from the test tiring [*sic*]?

A. Yes.

Q. Okay. Were you ever able to give an explanation for that?

A. No, I wasn't.

(RP 391, l. 17 to RP 393, l. 16)

NO. 35035-5-III

COURT OF APPEALS

DIVISION III

STATE OF WASHINGTON

STATE OF WASHINGTON,)	
)	SPOKANE COUNTY
Plaintiff,)	NO. 15 1 02422 2
Respondent,)	
)	
v.)	CERTIFICATE OF SERVICE
)	
ROY HOWARD MURRY,)	
)	
Defendant,)	
Appellant.)	
_____)	

I certify under penalty of perjury under the laws of the State of Washington that on this 30th day of July, 2018, I caused a true and correct copy of the *BRIEF OF APPELLANT* and to be served on:

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SPOKANE COUNTY PROSECUTOR'S OFFICE

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Washington State Penitentiary

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U.S. MAIL

s/ Dennis W. Morgan

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NO. 35035-5-III

COURT OF APPEALS

STATE OF WASHINGTON

DIVISION III

STATE OF WASHINGTON,

Plaintiff/Respondent,

V.

ROY HOWARD MURRY,

Defendant/Appellant.

ADDITIONAL STATEMENT OF AUTHORITIES

Dennis W. Morgan WSBA #5286
Attorney for Appellant
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COMES NOW, ROY HOWARD MURRY, by and through the undersigned attorney, and requests the Court to consider the following additional authorities in connection with his appeal:

The Champion (December 2018), FROM
THE PRESIDENT- NACDL (Appendix A).

DATED this 25th day of February, 2019.

Respectfully submitted,

s/ Dennis W. Morgan

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NO. 35035-5-III

COURT OF APPEALS

DIVISION III

STATE OF WASHINGTON

STATE OF WASHINGTON,)	
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Plaintiff,)	NO. 15 1 02422 2
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v.)	CERTIFICATE OF SERVICE
)	
ROY HOWARD MURRY,)	
)	
Defendant,)	
Appellant.)	
_____)	

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Appendix “A”

From the President: When Your Art Can and Will Be Used Against You: Hip-Hop, Expression, and the Criminal Justice System

By Drew Findling

The importance and prevalence of the hip-hop musical genre within American culture cannot be overstated. From an economic standpoint, for more than three decades, hip-hop has grown to a 10 billion dollar per year industry;¹ from an artistic standpoint, the genre has provided an expressive outlet for communities of people of color across America; and from a cultural political standpoint, hip-hop often touches on important issues that we as criminal defense attorneys experience throughout our practices — racism, mass incarceration, and collateral consequences. From Kendrick Lamar’s White House visit with President Obama to Killer Mike campaigning with Bernie Sanders, artists are increasingly utilizing their popularity and platform to shed light on the injustices faced by their communities. But despite the constantly growing popularity and economic success of hip-hop, prosecutors are often ignorant and uninformed about the significance and reality of the genre. These prosecutors often ignore the artistry and refuse to separate fact from fiction, continually utilizing hip-hop lyrics and imagery as factual evidence in cases across the country.

Hip-hop has, since its inception, contained elements of counterculture, anti-authoritarian lyrics, and political criticisms.² From Public Enemy and NWA in the 1980s to the rise of modern trap music in Atlanta, hip-hop has embodied the political realities of the lives of the artists and shared their experiences with wider communities. As any other musical genre, some aspects of hip-hop are literal and other aspects are illustrative. For example, trap music takes its name from a common term used to describe a place where drugs are sold, i.e., “the trap.”³ But, as rapper/artist Quavarius Marshall, stage name Quavo, describes in his interview with *Noisey Atlanta*, trap describes a type of mentality and expression from the artists, one where constant and unending work is the only way to success.⁴ To him, being in the trap does not mean selling drugs out of a house. Rather, it is an embodiment of the work ethic required to be successful in any field.

Counterculture and political critique are not unique to hip-hop, and in fact can be found across myriad genres of music, literature, and art. Yet hip-hop still occupies a difference space than other artistic expression. Prosecutors and judges across the country seem unable or unwilling to separate the symbolism and hyperbole in rap lyrics from the life of the artist. In New Jersey, a man named Vonte Skinner, stage name “Real Threat,” was convicted in 2008 of attempted murder after a detective read 13 pages of Skinner’s lyrics to the jury. It was not until 2014 that the New Jersey Supreme Court ruled that there was an insufficient nexus between the lyrics, which were written years before the crime was committed, and the act in question. The court explained:

The difficulty in identifying probative value in fictional or other forms of artistic self-expressive endeavors is that one cannot presume that, simply because an author has chosen to write about certain topics, he or she has acted in accordance with those views. One would not presume that Bob Marley, who wrote the well-known song “I Shot the Sheriff,” actually shot a sheriff, or that Edgar Allan Poe buried a man beneath his floorboards, as depicted in his short story “The Tell-Tale Heart,” simply because of their respective artistic endeavors on those subjects. Defendant’s lyrics should receive no different treatment. In sum, we reject the proposition that probative evidence about a charged offense can be found in an individual’s artistic endeavors absent a strong nexus between specific details of the artistic composition and the circumstances of the offense for which the evidence is being adduced.⁵

The New Jersey Supreme Court perfectly highlighted the issue facing hip-hop artists — the disparate treatment between expression in hip-hop and other art forms. In May 2006, the U.S. Attorney’s Office published a bulletin titled “Understanding Gangs and Gang Mentality: Acquiring Evidence of the Gang Conspiracy,” which begins with this premise: “In today’s society, many gang members compose and put their true-life experiences into lyrical form.”⁶ Nowhere does the bulletin consider that lyrics could be symbolic, hyperbole, or simply artistic expression of the plight of others that the artist has seen in his or her lifetime. It assumes without evidence that lyrics speaking to violence or drug dealing must be reflective of that individual’s personal experience and essentially act as a confession. This sort of bulletin is premised on the idea that certain types of artistic expression can and should be used not just against famous rappers when they are charged with crimes, but every person who matches a specific archetype: young men of color who are suspected gang members. With this bulletin, the people at the U.S. Attorney’s Office are evidencing an intent to use all means at their disposal, searching websites including YouTube, SoundCloud, Instagram, and Facebook to see if the defendants have created any art that can be twisted into some kind of “confession” to be used against them in subsequent trials. More than that, the bulletin encourages investigators and prosecutors to scour a “suspect’s” social media for any type of expression — even when a suspect is quoting another person’s rap lyrics — for any indication that the “suspect” might be confessing to a murder, might rep a certain gang, or might generally display a character for violence. And yet in any other context, no prosecutor would attempt to enter mere lyrics or even retweets of another’s lyrics as some sort of confession or indictment on the defendant’s character.

Why does hip-hop hold this special place in the artistic world, where rapping about a murder can and often will be used against you? One has difficulty envisioning that, if Johnny Cash were on trial for murder, the fact that he sang that he shot a man in Reno would be used to show his violent tendencies, or that a prosecutor would argue that Al Pacino’s iconic role in *Scarface* shows he has a history of cocaine trafficking. It is because the hip-hop genre is dominated by young men of color. This kind of evidence is often used to establish gang affiliations, without regard to the fact that many of these young artists grew up in housing projects around drug dealing, street gangs, and rampant violence. Yet as these young men try to convey the life experience of growing up in such areas, law enforcement assumes they must be participating in these acts.⁷ In fact, in many

instances, smaller rap groups and “hybrid gangs” (so deemed by the local authorities) share the same name, and so prosecutors use this (intentionally created) confusion as a way to sneak in “violent” lyrics — even if they would not fit in under the umbrella of confession — as proof of their participation in a gang.⁸

On one hand, attempting to use rap lyrics as evidence leaves defense attorneys mired in the tangled web of attempting to explain their clients’ violent upbringing, their clients’ need to express themselves through a medium that conveys strength and control because they live in a world where they know they have neither, and their clients’ affiliation with a “label” to better their situation through artistic expression. On the other hand, defense counsel must try to convince the jury that the rap group and the gang are in fact different entities (although the rap lyrics may reference acts of violence to convey strength and status) and that the defendant is merely an artist. It is our role to educate jurors, judges, and prosecutors on this distinction, and to utilize clients’ artistry to their benefit rather than their detriment should the judge make the incorrect decision to admit such lyrics.

One of the best examples of the positive use of hip-hop in the criminal justice system occurred recently at the sentencing of Earl Simmons, whose stage name is DMX. His attorney, NACDL life member Murray Richman, played “Slippin,” a 1998 semi-autobiographical song, to express the hardships Simmons endured growing up and how far the rapper had come from his abusive, impoverished childhood.⁹ In that case, prosecutors asked the judge to sentence Simmons to five years. Instead, after hearing the song, the judge sentenced Simmons to 12 months.¹⁰ Richman demonstrates that by using hip-hop to educate the court on our clients’ lives we can use it as a tool for the defense rather than allowing prosecutors to attempt to use our clients’ artistic expression against them.

We have the responsibility to understand this medium of expression for what it is: free, artistic speech designed to empower our clients. Armed with this understanding, criminal defense lawyers must take on the mantle of educating judges and juries as to the hip-hop genre so that all parties will see it for what it is: a mixture of storytelling, expression, and cultural criticism. As criminal defense lawyers, we should actively discourage the far too often racially motivated attempts by prosecutors to unfairly weaponize this art form. Instead, defense lawyers must *present* it as evidence not only of racial or hip-hop culture, but additionally as evidence of contemporary American culture.

Notes

1. Julie Watson, *Hip-Hop: Billion-Dollar Biz* (Feb. 24, 2018), available at <https://abcnews.go.com/Business/story?id=89840&page=1>.
2. Andre Douglas Pond Cummings, *Thug Life: Hip-Hop’s Curious Relationship with Criminal Justice*, 50 *Santa Clara L. Rev.* 515, 517 (2010).
3. Thomas Morton, *Noisey Atlanta* (2015), available at https://video.vice.com/en_us/video/welcome-to-the-trap/55ce4bb923652a5532d4fbd8.
4. *Id.*
5. *New Jersey v. Skinner*, 218 N.J. 496 (2014).

6. Donald Lyddane, *Understanding Gangs and Gang Mentality: Acquiring Evidence of the Gang Conspiracy* (2006), available at <https://www.justice.gov/archive/olp/pdf/gangs.pdf>.
7. Andrea Dennis, *Poetic (In)Justice? Rap Music Lyrics as Art, Life, and Criminal Evidence*, 31 *Colum. J. L. & Arts* 1, 15 (2007).
8. Note 5, *supra*.
9. Elizabeth Chuck, *'Slippin' Played in Court Before Rapper DMX Gets a Year in Prison for Tax Evasion*, (2018), available at <https://www.nbcnews.com/pop-culture/pop-culture-news/slippin-played-court-rapper-dmx-gets-year-prison-tax-evasion-n861121>.
10. *United States v. Simmons*, No. 1:17-cr-00172-JSR-1 (2018).

February 25, 2019 - 7:20 AM

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