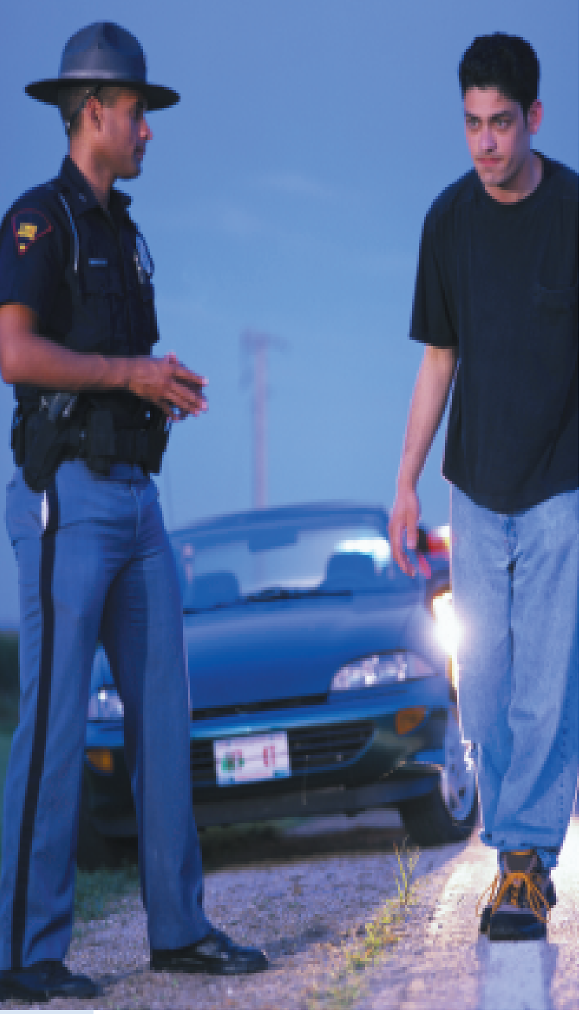

DWI

BY TED VOSK

Chaos Reigning

Breath Testing and The Washington State Toxicology Lab

"*Simulator solutions are being falsified as far as the certification.*"

This anonymous tip, left on a Washington State Patrol (WSP) message service on March 15, 2007, was not the first clue that there was something wrong in the Washington State Toxicology Lab. It was, however, the one that led to the revelation of the panoply of sins the Lab was guilty of: perjury, conspiracy, cover-ups, carelessness, reckless disregard for the truth, incompetence, and failures to follow universally accepted scientific standards. Twenty years of complacency and an overriding concern for facilitating successful prosecutions at the expense of sound science threatened the liberty of innocent citizens and the integrity of the system of justice itself. Now, a once highly respected state toxicologist has resigned and breath test results throughout the state, stretching back for at least half a decade, are in question.

Basic Problems And Requirements

"The private interest in the accuracy of a criminal proceeding that places an individual's life or liberty at risk is almost uniquely compelling."[1] "The ultimate mission of the system upon which we rely to protect the liberty of the accused as well as the welfare of society is to ascertain the factual truth."[2] To this end, "state and federal governments unquestionably have a legitimate interest in ensuring that reliable evidence is presented to the trier of fact in a criminal trial."[3] "The integrity of the adversary process depends both on the presentation of reliable evidence and the rejection of unreliable evidence."[4]

"The major danger of scientific evidence is its potential to mislead the jury; an aura of scientific infallibility may shroud the evidence and thus lead the jury to accept it without critical scrutiny."[5] In a prosecution for DUI, it is well accepted that forensic breath "test results are 'virtually dispositive of guilt or innocence.'"[6] Accordingly, the "correctness" of evidence proffered to establish an individual's blood alcohol concentration (BAC) is "crucial."[7] Absent substantial evidence to the contrary, "[a] citizen's . . . liberty will depend on the verdict of a machine."[8] Under these conditions, our legal system has a strong obligation to ensure that breath test evidence "meets a threshold of well-established scientific reliability."[9]

It is not simply the science itself that must be reliable, however, but those who conduct it. Forensic scientists are the holders of a unique "public trust."[10] Not only does their work have a significant impact on individuals' lives, but most who rely on it are unable to evaluate it for themselves.[11] Unfortunately, the frequent failures of forensic scientists to keep this public trust are well documented.[12] The state has a duty to require "proper standards of conduct" from its forensic scientists.[13]

Simulator Solutions And Breath Testing

Breath test machines operate utilizing the method of infrared spectroscopy. An infrared beam of known intensity is passed through a sample of an individual's breath. Alcohol in the individual's breath absorbs energy at specific wavelengths. A detector collects the beam after it has passed through the breath sample and compares its final intensity with the value it started with. If done correctly, the decrease in intensity at "ethanol wavelengths" allows us to quantify an individual's BAC. It is critical to note, however, that even when done correctly, "[b]reath alcohol analysis results, like all measurements, possess uncertainty."[14]

The result of any measurement is only an approximation of the particular quantity being measured.[15] "Whenever the true value of the measured quantity is needed . . . bias can be a serious problem."[16] A "result is complete" only when an instrument's bias has been determined and the result corrected for that bias.[17] The reporting of BAC results is no exception. Where bias exists in a breath test machine, any results it yields must be corrected for that bias before they are reported.[18] "The forensic scientist must have the relevant information and perform the computations before trial [and] [t]hese must [] be disclosed to attorneys for both sides prior to trial."[19]

A reference material is a substance whose properties are sufficiently well known to be used for the calibration of a measuring instrument and the assessment of its accuracy.[20] "The accuracy of breath alcohol measurements is determined by the measurement of known . . . and traceable standards" called simulator solutions.[21] Simulators are one of the necessary safeguards for accurate breath test results.[22]

> [T]he simulator is a device that contains a glass jar and the top portion has a thermometer, a motor, and heating elements

> and ports. The purpose of it is to simulate a breath alcohol sample. And it contains a solution of alcohol and water that has been prepared. The solution is heated. . . . And then it can produce a known vapor alcohol concentration and it can be used as a calibrating device and as a testing device when you are testing a breath test, any type of breath test instrument.[23]

Proper calibration and calibration check procedures are the primary means of minimizing and determining bias and assuring the forensic acceptability of breath test machines and their results.[24] "'Calibration' is the process of standardizing [a breath test] instrument to a known ethanol vapor concentration."[25] Although proper calibration will minimize bias, it does not necessarily eliminate it. In order to determine an instrument's bias, a series of measurements must be performed on a distinct reference standard following calibration. The difference between the mean of those measurements and the value of the reference standard is the bias of the instrument. Once determined, bias can be corrected for utilizing the following expression:[26]

Eq. 1

$BAC_c = BAC \cdot (u_r/\bar{u})$ where
BAC_c = the BAC after being corrected for bias
$\bar{u}$ = mean of the measurements
u_r = the reference value for our simulator solution

The calibration and determination of bias are parts of a quality assurance program that should be performed on every instrument before being placed in the field. Another necessary safeguard is the performance of a control test accompanying every subject test.[27] This allows one to determine whether the machine is capable of reporting accurate values at the time a test is administered.

At the base of all this are the simulator solutions. Properly certified simulator solutions are critical not only in calibrating and determining the accuracy of a breath test machine generally, but in determining the accuracy of each individual test administered.[28]

Scientific Reliability

If citizens "are to have any confidence" in state breath-testing programs, those programs must "have some credence in the scientific community as a whole."[29] This requires compliance with scientific standards recognized internationally "both inside and outside of the field of forensic science."[30] These include standards set forth by the International Organization for Standardization (ISO) and the National Institute of Standards and Technology (NIST).[31] ISO 17025 specifies the general requirements that all labs must meet in order to be deemed competent to perform measurements and/or calibrations.[32] NIST standards also apply to the utilization of simulator solutions as reference materials in forensic breath testing.[33]

Some of these standards are matters of common sense. All data and calculations should be checked for accuracy before being reported.[34] Where computers are being utilized to process, evaluate or report data or calculations, software/programming must be checked to verify that it is functioning properly.[35] This is particularly true where programming modifications have been made.[36] When clear deviations from proper measurement practices occur, results should be discarded whether or not they appear reasonable.[37] And, every lab must conduct periodic audits of its activities to ensure the validity of its test and/or calibration results.[38]

Other standards require reference material producers to utilize "accepted statistical principles for the assignment of property values."[39] Take, for example, the discarding of data. The natural uncertainty attendant to any measurement necessarily leads to scientifically valid measurements that deviate more than others from the mean.[40] Whether intentional or not, if data is rejected simply because it fails to conform to preconceived expectations, the outcome is analogous to fixing the results.[41] "An outlying observation may be merely an extreme manifestation of the random variability inherent in the data. If this is true, the value should be retained and processed in the same manner as the other observations in the sample."[42]

On the other hand, a result may be statistically invalid (an outlier) if its deviation from the mean of a set of measurements is greater than can be justified by statistical fluctuations.[43] If a lab permits data to be discarded absent identified deviations from proper procedures, it must develop uniform policies governing the investigation and treatment of outliers "based on accepted statistical principles."[44] The most common criterion utilized is the ratio of the difference between the suspected outlier and the mean of the data to the standard deviation:[45]

Eq. 2

$C < |X_{ol} - M| / SD$ where
C = decision point
X_{ol} = suspected outlier
M = mean of the measurements
SD = standard deviation of the measurements

The value chosen for C determines the likelihood that the suspected outlier is spurious.[46]

Other standards govern the fact that "results obtained when analyzing reference materials should be interpreted with consideration given to the conditions of measurement."[47] "Within-laboratory" characterization occurs "when a substance is analyzed using the same method under the same conditions, that is, by the same operator, with the same equipment, on the same day and in a single laboratory."[48] "Between-laboratory" characterization "concerns results obtained when the same material is analyzed by the same method under different conditions, whether different analysts, operators, instruments, or laboratories."[49]

The arithmetic (common) mean of a group of numbers is determined by adding the numbers up and dividing by how many numbers we have:

Eq. 3

$M = (\Sigma_i X_i)/n$

This operation is appropriate for determining the mean of "within-laboratory" characterization data.

When "between-laboratory" characterization data is utilized, a weighted mean must be considered.[50] To find the traditional weighted mean, we calculate the arithmetic mean of distinct groups of data separately, determine a weight to assign each and combine them as follows:[51]

Eq. 4

$WM = \Sigma_i (w_i M_i) / \Sigma_i w_i$ where
M_i = the classical weighted mean of the i^{th} set of measurements
$w_i = n_i / SD_i$ (the weighting factor)
n_i = the number of measurements in the i^{th} set of measurements
SD_i = the standard deviation of the i^{th} set of measurements (precision)

The weight assigned to a particular group of measurements represents the scientist's confidence in the precision and the accuracy of those measurements.[52] The weighted mean (WM) attaches greater weight to "groups of measurements that are more precise whereas the arithmetic mean attaches equal weight to all measurements."[53] Generally, these means are not equal.[54] The WM yields the highest probability estimate of the true property value.[55]

"There are many situations in which it would be very misleading to average quantities without [weighting them]."[56] When there are *significant* "between-laboratory" differences in precision and assigning a value to a reference material is our objective, a WM should be utilized.[57] What constitutes *significant* is determined by the impact the differences have on the purpose for which the reference material is needed.[58] "[A] weighted mean provides a better estimate of the true simulator solution value and should be employed for those cases in which significant [between-laboratory] variability exists."[59]

Proper Standards Of Conduct

"Professional ethics provide the basis for the examination of evidence and the reporting of analytical results."[60] This requires that forensic toxicologists carry out their professional responsibilities "with honesty and integrity, and refrain from any knowing misrepresentation of . . . evidence and results of examinations, or other material facts."[61] It also requires that they "strive to ensure that forensic science is conducted in accordance with sound scientific principles."[62]

"Users of forensic laboratory services must rely on the reputation of the laboratory, the abilities of its analysts and the standards of the profession."[63] As one local court recognized, state forensic labs are "not created . . . as an advocate or surrogate for the state. While [they] will always assist the state, [they] must never do so at the cost of scientific accuracy or truth."[64] "The guiding principle should be that the end does not justify the means; the means must always be in keeping with the law and with good scientific practice."[65]

Chaos Reigning

Approximately 60 simulator solutions are prepared and certified every year by the Washington State Toxicology Lab. Certification requires that a minimum of three toxicologists test each solution before it can be used as a reference standard. Requiring that multiple toxicologists independently test a solution helps ensure the accuracy of the certification. In 2003, Lab Supervisor Ed Formoso began running two sets of tests on each solution, one in his name and one in Lab Manager Ann Gordon's name. In general, it has been shown that solution certification data may vary in a manner peculiar to each scientist.[66] Formoso is no different. When two sets of his data are included, as opposed to one, it generally skews the certified value for a solution.

With Formoso's knowledge, Gordon signed a declaration under penalty of perjury for each solution stating that she "examined and tested this solution."[67] These declarations are intended to be relied upon in lieu of live testimony. They also provide the necessary foundation for Lab personnel to testify that they found a solution to be accurate. Each declaration was a lie.[68]

The purpose of the conspiracy was to facilitate successful prosecutions of citizens charged with DUI. According to a 2004 internal review by the WSP, "successful case prosecutions are top priorities for the Lab . . . [while] policies and required procedures appear to be of secondary concern."[69] Under Gordon, sound scientific practice was made secondary to the facilitation of successful DUI prosecutions.

WSP brass assigned State Toxicologist Dr. Logan to investigate the March 2007 complaint. He delegated this to Gordon who submitted an investigative memo, co-authored by Formoso, indicating no basis for the complaint. Although Logan learned days later that Formoso was testing solutions for Gordon, he informed no one, permitting the false memo to stand uncontradicted.

At least seven other toxicologists engaged in multiple incidents of false swearing, signing declarations under penalty of perjury, and reporting solution values that were false. This occurred because it was standard practice for the toxicologists to sign these declarations without checking to ensure that the data being reported was correct. That this flowed from laziness as opposed to intentional deceit does not change the result.

Although inclusion of "Gordon's data" skewed certified solution values, rendering thousands of breath tests statewide invalid,[70] it has not been removed from a single certification.

The investigation into Gordon's perjury revealed that the software used by the Lab to certify solutions was not operating correctly. Due to programming errors, values reported for at least 32 solutions between August 2005 and August 2007 were wrong. Prior to this, no one had ever checked the software to ensure that it was operating correctly. Many of the toxicologists, including senior supervisors, admitted that they could not have checked the calculations because they did not know the simple algebra necessary to do so. Although Logan originally assured the public that only eight tests were impacted by software/programming errors, it was later shown that thousands of tests statewide were affected.[71]

Subsequently, at least 170 additional errors (not related to software) affecting 88 different solutions were identified. These include entering incorrect measurement data, signing off on the wrong data, mixing up data for different solutions, entering incorrect control values, and failing to identify the controls used. Toxicologists never checked to see if the data they were reporting matched the results of their measurements. They simply assumed data attributed to them was correct and signed off on it. And again, thousands of breath tests statewide were rendered invalid as a result.[72]

The next issues to be considered are the practices of discarding valid data and using bad data. To be useful as a reference material, simulator solutions must have certain alcohol concentration values. The value assigned to a solution is the mean of the data collected by multiple toxicologists. The mean must either lie within a certain range or be discarded. Toxicologists were trained not to use data from any run containing a single value falling outside the required range. Instead, such data was rejected and new measurements made. If each new value fell within range, the data was used. This is tantamount to fixing one's data. Unless a solution has been *grossly* misprepared, no solution will ever fail to fall within the required range!

In a two-year period, at least five solutions were certified after valid data had been discarded. Had any type of outlier analysis been performed, the data in question would not have been discarded. The miscertification of these five solutions alone rendered thousands of breath tests invalid statewide.[73] In December 2007, the Lab adopted statistically sound outlier criteria. Still, the Lab fails to recognize the physical significance of adhering to it. One solution, certified prior to December, has so many outliers that the state's methodology requires it to be discarded. Nonetheless, the solution remains in use — tainting test results statewide.

Data obtained in violation of proper measurement procedures is another major problem. When a solution is certified, an external control is tested with it to ensure that the chromatograph utilized to perform the testing is capable of returning an accurate value. If the chromatograph encounters a particular malfunction,[74] it will be indicated in the results by what is referred to as a low ISTD area. This renders data collected during the run unreliable so that it must be discarded. At least 13 solutions have been certified with such data and some are still being used in the administration of breath tests today.

Then there is the issue of WMs. Over 90 percent of solution certifications are performed on multiple instruments. This includes an instrument that had a known history of not always functioning properly. The WM has been shown to be more precise than the arithmetic mean in the certification process. Moreover, the differences between the two methods are significant enough to cause an individual's liberty to be wrongly deprived. Nonetheless, the Lab still refuses to utilize a weighted mean because it assumes that the liberty of "only a few" will be affected by any errors.

An even greater cause for concern is the fact that in Washington, the state ignores bias when reporting BAC results. Even though the bias of each breath test machine is determined before it is placed in the field, BAC results are reported without correcting for it. Given the typical magnitude of bias encountered,[75] the majority of BAC results reported may be false and even misleading. Although acknowledging the problem, the state adheres to the practice because, again, it assumes the liberty of "only a few" will be affected, and it finds that acceptable.

This "minimal impact" is belied by the fact that the relative bias of a small sample of randomly selected breath test machines was discovered to be .007. It was later determined that one of these machines was operating outside the required ±5 percent accuracy limit. When the effects of the aforementioned errors are factored in, discrepancies in BAC of at least .01 are reasonably anticipated.

Sadly, in the 20 years the Lab has certified solutions for breath testing, the process has never been subject to an audit. When it finally was audited in the wake of this scandal, it failed miserably. According to Logan, "The Lab became complacent. Everybody involved in the process became complacent." The Lab anticipates being able to pass its first audit of this process by mid-summer 2008.

The most alarming discovery may be that of State Toxicologist Barry Logan's incompetence. According to Logan, in order to be competent he must understand how BAC results are affected by bias. Despite 18 years as the state toxicologist, an adequate understanding of bias in breath testing eluded him. In a public notification discussing the errors above, Logan engaged in a bias analysis that was simplistic, inaccurate, and misleading.

Nor is this the first example of his incompetence. In order to place the state's breath test program on more scientifically sound footing, he formerly required simulator thermometers to be certified "traceable to NIST." Although traceability is a well-understood concept throughout the scientific community, Logan neither knew how to comply with his own requirement nor took the time to visit the NIST Web site to find out.[76] When breath tests were suppressed statewide because of the failure to comply with this standard,[77] instead of fixing the problem, Logan simply eliminated the requirement.

The Response

Confronted with Gordon's and Formoso's conduct, an administrative hearing officer concluded:[78]

> Whether one labels this conduct fraudulent misrepresentation and perjury, or extremely deceitful and completely dishonest. . . . The fact that the Laboratory management engaged in such dishonest conduct is an appalling reflection on the credibility of the laboratory.

Courts have acted variously under state statutes governing the admissibility of breath tests and/or ER 702/703.[79] As determined by the King County District Court:[80]

> [U]nder ER 702, the work product of the WSTL has been so compromised by ethical lapses, systemic inaccuracy, negligence and violations of scientific principles that the simulator solution work product would not be helpful to the trier of fact.

And prosecutors in several jurisdictions, unwilling to imperil a citizen's liberty based on this evidence, have voluntarily suppressed tests.

A democratic republic relies upon the confidence citizens may have in those who serve in government.[81] Its laws must never become so concerned with efficiency "that it fails to sort out simple instances of right from wrong."[82] The state has an obligation to ensure that evidence presented to deprive citizens of their liberty meets some minimum threshold of reliability.[83] This includes adherence to accepted scientific standards.[84] Logan and Gordon have both resigned. The state's breath test program now anticipates being ISO compliant, and able to pass its first audit ever, this summer. Only then will "reliable and accurate" breath tests be a possibility. And only then will justice again permit their use in a court of law.[85]

Notes

1. *Ake v. Oklahoma*, 470 U.S. 68, 78, 105 S. Ct. 1087 (1985).

2. *Commonwealth of Northern Mariana Islands v. Bowie*, 243 F.3d 1109, 1117-18 (9th Cir. 2001).

3. *U.S. v. Scheffer*, 523 U.S. 303, 309, 118 S. Ct. 1261 (1998).

4. *Taylor v. Illinois*, 484 U.S. 400, 414-15, 108 S. Ct. 646 (1988); *State v. Roche*, 59 P.3d 682, 695 (Wash. 2002); *Bolden v. State*, 967 S.W.2d 895, 899 (Tex. App. 1998); *see generally*, *First Nat. Bank of Boston v. Bellotti*, 435 U.S. 765, 789, 98 S. Ct. 1407 (1978).

5. Paul C. Giannelli, *The Admissibility of Novel Scientific Evidence: Frye v. United States, a Half-Century Later,* 80 Colum. L. Rev. 1197, 1237 (1980); *U.S. v. Addison*, 498 F.2d 741, 744 (D.C. Cir. 1974); *Reese v. Stroh*, 874 P.2d 200, 205 (Wash. App. 1994); *State v. Brown*, 687 P.2d 751, 773 (Or. 1984); *State v. Aman*, 95 P.3d 244, 249 (Or. App. 2004).

6. *Mack v. Cruikshank*, 2 P.3d 100, 104 (Ariz. App. 1999) (quotation omitted); *see also*, *State v. Cohen*, 104 P.3d 70, 72 (Wash. App. 2005); *South Dakota v. Neville*, 459 U.S. 553, 564, 103 S. Ct. 916 (1983); *Cf.*, *State v. Jayne*, 24 P.3d 920, 927 (Or. App. 2001) (urinalysis test).

7. *State v. Clark*, 593 P.2d 123, 126 (Or. 1979) (*quoting State v. Clark*, 583 P.2d 1142, 1145 (1978)).

8. *State v. Garthe*, 678 A.2d 153, 158 (N.J. 1996); *State v. McElroy*, 568 So.2d 1016, 1016-17 (La. 1990) (Dennis, J., concurring).

9. *State v. Dilliner*, 569 S.E.2d 211, 223-24 (W.Va. 2002) (Starcher, J., concurring); *State v. Honeyman*, 560 So.2d 825, 829 (La. 1990); *See*

generally, *Scheffer*, 523 U.S. at 309; *Taylor*, 484 U.S. at 414-15; Manson v. Brathwaite, 432 U.S. 98, 114, 97 S. Ct. 2243 (1977); *California v. Green*, 399 U.S. 149, 163 n.15, 90 S. Ct. 1930 (1970); *Green,* 399 U.S. at 186 n.20 (Harlan, J., concurring).

10. American Society of Crime Lab Directors, Guidelines for Forensic Laboratory Management Practices, 1 (1994).

11. ASCLD, Guidelines for Forensic Laboratory Management Practices, 1, 4.

12. Maurice Possley, et. al.,, *Flawed Work, Resistance to Scrutiny Seen Across U.S.*, Chicago Tribune, October 21, 2004; Ruth Teichroeb, *Rare Look Inside State Crime Labs Reveals Recurring DNA Test Problems*, *Seattle Post-Intelligencer, July 22, 2004;* Ruth Teichroeb, *State Patrol Fires Crime Lab Scientist*, Seattle Post-Intelligencer, March 24, 2004; Leslie A. Pappas, *Pa. Crime-Lab Scientist's Errors Prompt Alert to 27 Counties*, Philadelphia Inquirer, June 19, 2003; Roman Khanna & Steve McVicker, *Police Chief Shakes Up Crime Lab - 2 Officials Quit, Others Disciplined,* Houston Chron., June 13, 2003; *Errors at F.B.I. May Be Issue in 3,000 Cases,* N.Y. Times, March 17, 2003; Rene Stutzman, *Crime-Lab* Worker Puts Cases in Doubt, *Orlando Sentinel, July 19, 2002; Office of the Inspector General, Department of Justice, The FBI Laboratory: An Investigation into FBI Laboratory Practices and Alleged Misconduct in Explosives-Related and Other Cases (April 1997), http://www.usdoj.gov/oig/special/9704a/ (last visited April 5, 2008);* Richard L. Fricker, *Pathologist's Plea Adds to Turmoil: Discovery of Possibly Hundreds of Faked Autopsies Helps Defense Challenges, 79 A.B.A. J. 24 (1993);* State v. Roche, 59 P.3d 682, 695 (Wash. 2002); *State of West Virginia v. Zain,* 528 S.E.2d 748 (W.Va. 1999); *In re an Investigation of the W. Va. State Police Crime Lab., Serology Div.*, 438 S.E.2d 501 (W.Va. 1993).

13. *State v. Roche*, 114 Wn. App. 424, 446 (2002).

14. Rod Gullberg, *Common Legal Challenges and Responses in Forensic Breath Alcohol Determination*, 16(2) Forens. Sci. Rev., 92, 93 (2004); Rod Gullberg, *Breath Alcohol Measurement Variability Associated with Different Instrumentation and Protocols*, 131(1) Forens. Sci. Int. 30-35 (2003); A.W. Jones, *Dealing with Uncertainty in Chemical Measurements*, 14(1) Newsl. Int. Assoc. Chem. Testing 6-11 (2003).

15. National Institute of Standards and Technology, Guidelines for Evaluating and expressing the Uncertainty of NIST Measurement Results, NIST Technical Note 1297, §2.1 (1994).

16. National Institute of Standards and Technology, Standard Reference Materials, Handbook for SRM Users, NIST Special Publication 260-100, 4 (1993).

17. NIST TN 1297, § 2.1, 5.2, App. D 1.1.6 – 8 (1994).

18. Jones, *supra*, note 14, at 11.

19. Gullberg, *supra*, note 14, Forens. Sci. Rev., at 94.

20. International Organization for Standardization, Reference Materials — General and Statistical Principles for Certification, ISO Guide 35:2006(E), 2 (2006); National Institute of Standards and Technology, Statistical Aspects of the Certification of Chemical Batch SRMs, NIST Special Publication 260-125, 2 (1993); NIST SP 260-100, p. 53; Society of Forensic Toxicologists/American Academy of Forensic Scientists, Forensic Toxicology Laboratory Guidelines, § 9.3.1 (2006).

21. Rod Gullberg, *Using a Weighted Mean to Compute the Values of Simulator Solution Standards*, 14(3) J. Anal. Toxicol. 196 (1990); Patrick Harding, *Methods for Breath Analysis*, *in* Medical-Legal Aspects of Alcohol 185, 187 (James Garriott ed., 4th ed. 2003).

22. Harding, *supra*, note 21, at 187; *State v. Straka*, 810 P.2d 888, 894 (Wash. 1991).

23. *Straka*, 810 P.2d at 894.

24. Canadian Society of Forensic Science, *Recommended Standards and Procedures of the Canadian Society of Forensic Science Alcohol Test Committee*, 36(3) Soc. Forens. Sci. J. 101, 113 (2003); Harding, *supra*, note 21, at 187; Washington State Patrol Breath Test Section, Policy and Procedure Manual, 24 (2007); Washington State Patrol Breath Test Section, Training Outline For DataMaster and PBT, Operator Basic, 27 (2004).

25. WSP BTS, Policy and Procedure Manual, 23; Washington State Patrol Breath Test Section, Policy and Procedure Manual, 22 (2005).

26. Rod Gullberg, *Confidence Interval Calculation for Specific Subject Test Results*, 3 (2007).

27. Kurt Dubowski, *Quality Assurance in Breath-Alcohol Analysis*, 18 J. Anal. Toxicol. 306-311(1994).

28. Harding, *supra*, note 21, at 187; Dubowski, *supra*, note 27, at 306-311; Gullberg, *supra*, note 21, at 196; *Straka*, 810 P.2d at 894.

29. *City of Seattle v. Clark-Munoz*, 93 P.3d 141, 145-46 (Wash. 2004) (*quoting* ruling by district court panel).

30. The Crime Lab Report, ASCLD/LAB Accreditation, How the Profession Was Revolutionized by Standards and Controls,http://www.crimelabreport.com (last visited January 10, 2008); Canadian Society of Forensic Science, *supra*, note 24, at 101.

31. The Crime Lab Report, *supra*, note 30; American Society of Crime Lab Directors/Laboratory Accreditation Board, *Breath Alcohol Accreditation Program*, ASCLD/Lab Newsl., June 1, 2007, at 5; American Society of Crime Lab Directors, Lab International Accreditation Program, 5-6 (2006); International Organization of Legal Metrology, Breath Alcohol Analyzers, 2 (2006); *Clark-Munoz*, supra.

32. International Organization for Standardization, General Requirements for the Competence of Testing and Calibration Laboratories, ISO/IEC 17025, 1 (2005); National Institute of Standards and Technology, NIST Handbook *150*, v (2001); ASCLD/Lab Newsl., *supra*, note 30, at 5; ASCLD, Lab International Accreditation Program, at 5-6.

33. John Fusco, Basic Science of Evidential Breath Alcohol Testing, 20 (2007); Harding, *supra*, note 21, at 188; Committee on Alcohol and Other Drugs, National Safety Council, Recommendation of the Subcommittee on Technology, Appendix K, 137-38 (1996); Dubowski, *supra*, note 27, at 310 (1994); Kurt Dubowski, Technology of Breath-Alcohol Analysis 42 (DHHS, National Institute on Alcohol Abuse and Alcoholism Publication No. ADM 92-1728, 1992); National Institute of Standards and Technology, OLES Standard Reference Materials for the Forensic Sciences, Ethanol Solutions, https://srmors.nist. gov/tables/view_table.cfm?table=105-3.htm (last visited April 2, 2008).

34. ISO/IEC 17025 § 5.4.7.1; International Organization for Standardization, General Requirements for the Competence of Reference Material Producers, ISO Guide 34:2000(E) § 5.13.1 (2000); SOFT/AAFS, *Forensic Toxicology Laboratory Guidelines*, § 10.1 (2006).

35. ISO/IEC 17025: § 5.4.7.2; ISO Guide 34:2000(E) § 5.13.2(a); NIST Handbook 150 §5.4.7.1; David Brodish, *Computer Validation in Toxicology: Historical Review for FDA and EPA Good Laboratory Practice*, 6 Quality Assurance 185, 194 (1999).

36. ISO/IEC 17025 § 5.4.7.2; NIST Handbook 150 §5.4.7.1; National Institute of Standards and Technology, Reference Data: Software Fault and Failure Characteristics — Fault Handbook — Quality Assurance, http://hissa.ncsl.nist.gov/effProject/handbook/failure/QA.htm (last visited 10/03/07).

37. American Society for Testing and Materials, Standard Practice for Dealing with Outlying Observations, ASTM Designation E 178 – 02, § 4 (2002).

38. ISO/IEC 17025 § 4.14; ISO Guide 34:2000(E) § 4.12; ASCLD, *Lab International Accreditation Program*, 14.

39. ISO Guide 34:2000(E) § 5.15.1; ISO/IEC 17025:1999(E) § 5.7.1; NIST SP 260-100, 20.

40. ASTM Designation E 178 – 02, § 1.1.1.

41. J. Taylor, An Introduction to Error Analysis: The Study of Uncertainties in Physical Measurements, 166 (2nd ed. 1997); Meyer, Data

ANALYSIS: FOR SCIENTISTS AND ENGINEERS, 18 (1975).

42. ASTM Designation E 178 – 02, § 1.1.1; ISO GUIDE 35:2006(E) § 10.5.5; BEVINGTON, DATA REDUCTION AND ERROR ANALYSIS FOR THE PHYSICAL SCIENCES, 56 (2003); MEYER, *supra*, note 41, at 17.

43. ISO GUIDE 35:2006(E) § 10.5.5; NIST SP 260-100, 79.

44. ISO GUIDE 34:2000(E) § 5.15.1(a); SOFT/AAFS, *Forensic Toxicology Laboratory Guidelines*, § 8.3.9; NIST SP 260-100, 79; ASTM Designation E 178 – 02, § 1.

45. NIST SP 260-100, 80; ASTM Designation E 178 – 02, § 6.1-§ 6.2; TAYLOR, *supra*, note 41, at 170; MEYER, *supra*, note 41, at 17-18; Rod Gullberg, *Useful Mathematical and Statistical Equations*, 11 Course materials prepared for the Borkenstein Institute (2006).

46. NIST SP 260-100, 80.

47. NIST SP 260-100, 33.

48. Jones, *supra*, note 14, at 7.

49. *Id*.

50. Gullberg, *supra*, note 21, at 196-98.

51. Gullberg, *supra*, note 45, at 4; Robert Paule, et. al., *Consensus Values and Weighting Factors*, 87 J. RESEARCH, NAT'L BUREAU OF STANDARDS, 377-385 (1982); NIST SP 260-100, 78; ISO GUIDE 35:2006(E) App. B.7; Gullberg, *supra*, note 21, at 196-97; BEVINGTON, *supra*, note 42, at 57; TAYLOR, *supra*, note 41, at 175-76.

52. BEVINGTON, *supra*, note 42, at 56-57.

53. Gullberg, *supra*, note 21, at 196-98.

54. Paule, *supra*, note 51, at 380.

55. TAYLOR, *supra*, note 41, at 173-75; BEVINGTON, *supra*, note 42, at 57.

56. FREUND, MODERN ELEMENTARY STATISTICS, 39 (4th 1973).

57. NIST SP 260-100, 79; Gullberg, *supra*, note 21, at 196-98; TAYLOR, *supra*, note 41, at 173-77.

58. NIST SP 260-100, 2-3; NIST SP 260-125, 21-22, 30; ISO GUIDE 34:2000(E) § 5.15.1.

59. Gullberg, *supra*, note 21, at 198.

60. ASCLD, GUIDELINES FOR FORENSIC LABORATORY MANAGEMENT PRACTICES, 5.

61. American Board of Forensic Toxicology, Code of Ethics, http://www.abft.org/Ethics.asp, (last visited April 3, 2008).

62. ASCLD, GUIDELINES FOR FORENSIC LABORATORY MANAGEMENT PRACTICES, 5.

63. ASCLD, GUIDELINES FOR FORENSIC LABORATORY MANAGEMENT PRACTICES, 4.

64. *State v. Amach*, No. C00627921 (King Co. Dist. Ct., WA – 1/30/08); *see also* Ruth Teichroeb, *Crime Labs Too Beholden to Prosecutors, Critics Say*, Seattle Post-Intelligencer, July 23, 2004.

65. ASCLD, GUIDELINES FOR FORENSIC LABORATORY MANAGEMENT PRACTICES, 1.

66. Gullberg, *supra*, note 21, at 196-98.

67. "After reviewing the entire record … I have no difficulty finding that the pattern of conduct engaged in by Mr. Formoso and Ms. Gordon . . . was carried out with full knowledge that false representations were being made, even under the penalty of perjury." *Dept. of Licensing v. Arnston*, # omitted (12/04/07).

68. "Decency, security, and liberty alike demand that government officials shall be subjected to the same rules of conduct that are commands to the citizen. In a government of laws, existence of the government will be imperiled if it fails to observe the law scrupulously. . . . Crime is contagious. If the government becomes a lawbreaker, it breeds contempt for law; it invites every man to become a law unto himself; it invites anarchy." *Olmstead v. U.S.*, 277 U.S. 438, 468, 48 S. Ct. 564 (1928) (BRANDEIS, J. *dissenting*).

69. Internal audit by the Washington State Patrol, 2004.

70. As an example, one solution that included Gordon's perjured data was used to calibrate and test the accuracy of 11 breath test machines before they were sent into the field for use. Once the tainted data was removed, it was discovered that the solution no longer satisfied the toxicologist's requirements for solutions that were to be used for such purposes. As a result, none of the instruments should have been permitted to be relied upon in the field. Nonetheless, a minimum of 1,679 tests were administered to motorists on these machines. Not a single one of these citizens has yet been notified of the error by the state.

71. As an example, software/programming errors resulted in the wrong values being certified for two solutions used to calibrate and test the accuracy of 16 breath test machines before they were sent into the field for use. A minimum of 3,000 tests were administered to motorists on these machines. Not a single one of these citizens has yet been notified of the error by the state.

72. One toxicologist, for example, mixed up the data for two solutions she was testing. One was a solution meant to be used during the calibration process while the other was intended as a field solution to be used to determine whether a breath test machine could render an accurate result at the time of an actual test. There is no way to determine which set of data belongs to which solution. The mistake was not discovered until five years later during the litigation ignited by the Gordon revelations. Combined, use of these solutions rendered approximately 10,000 breath tests statewide completely invalid.

73. As an example, the discarding of data for one solution so changed the certified value that when the original data is substituted back in, several breath test machines are no longer able to satisfy the requirement that they be accurate to within ± 5 percent. The accuracy of at least 32 machines was incorrectly determined using this solution with a minimum of 3,445 tests being administered on them. Not a single one of these citizens has yet been notified of the error by the state.

74. *E.g.*, a stuck injector needle.

75. Because in Washington bias is always determined by values rounded to the fourth decimal place while all BAC results are reported truncated to the third, a bias of +.0001 or more automatically reduces a BAC result by .001. This is easily proven. Consider the following proof by contradiction:

1. Let:
   - A. X be the BAC reported by a DataMaster (reported to 3 decimal places);
   - B. Y_3 be the first 3 decimal places of the corrected BAC.
     - i. $Y_3 = X_c$ truncated to 3 decimal places.
   - C. Y_{4+} be all decimal places of the corrected BAC beyond the first 3.
     - i. $Y_3Y_{4+} = X \cdot (u_r/\bar{u}) = X_c$ untruncated.
   - D. $\bar{u} - u_r \geq .0001$ (positive bias of .0001 or higher).
2. From this we know that:
   - A. $u_r/\bar{u} < 1$.
   - B. So that when our correction is expressed to all available decimal places:
     - i. $X > X \cdot (u_r/\bar{u})$ or, equivalently
     - ii. $X > Y_3Y_{4+}$.
3. Our contention, wherever a DataMaster is found to have a positive bias of .0001 or higher the corrected BAC (truncated to 3 decimal places) of a test will always reduce the original value by at least .001, is true if $X > Y_3$.
4. Assume by way of contradiction that $X \leq Y_3$:
   - A. Case 1: $X < Y_3$
     - i. $Y_3 \leq Y_3Y_{4+}$
     - ii. $X < Y_3Y_{4+}$: Combining 4A and 4Ai.
     - iii. $X > Y_3Y_{4+}$: From 2Bii.
     - iv. $\neg(X < Y_3)$: 4Aii and 4Aiii are contradictory.
   - B. Case 2: $X = Y_3$
     - i. $Y_3 \leq Y_3Y_{4+}$
     - ii. $X \leq Y_3Y_{4+}$: Combining 4B and 4Bi.
     - iii. $X > Y_3Y_{4+}$: From 2Bii.
     - iv. $\neg(X = Y_3)$: 4Bii and 4Biii are contradictory.
   - C. $\neg(X \leq Y_3)$: Combining 4Aiv and 4Biv.
   - D. $\neg(X \leq Y_3) \rightarrow X > Y_3$: Law of the excluded middle.
5. $X > Y_3$

QED

76. The author actually realized this at a public hearing when the NIST traceability

regulation was being proposed. I approached Dr. Logan and informed him that I thought this was the case and would be problematic for the admissibility of breath tests. I then told him that I had previously spoken with Dr. Ashley Emery of the University of Washington, an expert on the subject, and that Dr. Emery would instruct the state on how to comply with the standard at no cost. Logan, without response, turned and walked away. Dr. Emery's testimony subsequently provided the factual basis for the state's opinion in *Clark-Munoz*, supra.

77. *Clark-Munoz*, supra.

78. *Dept. of Licensing v. Arnston*, # omitted, at 17-18 (12/04/07).

79. *Ludvigsen v. City of Seattle*, 174 P.3d 43 (Wash. 2007) (Madsen, J., concurring); *City of Fircrest v. Jensen*, 143 P.3d 776 (Wash. 2006); RCW 46.61.506.

80. *State v. Amach*, No. C00627921 (King Co. Dist. Ct., WA – 1/30/08).

81. The Ethics in Public Service Act, Laws of 1994, ch. 154, § 1; *Olmstead*, 277 U.S. at 468 (Brandeis, J., *dissenting*).

82. *ABF Freight System, Inc. v. NLRB,* 510 U.S. 317, 325, 114 S. Ct. 835 (1994) (Kennedy, J. con.); *Olmstead*, 277 U.S. at 468 (Brandeis, J., *dissenting*).

83. *Dilliner*, 569 S.E.2d at 223-24 (Starcher, J., concurring); *Honeyman*, 560 So.2d at 829; *See generally*, *Scheffer*, 523 U.S. at 309; *Taylor*, 484 U.S. at 414-15; Brathwaite, 432 U.S. at 114; *Green*, 399 U.S. at 163 n.15; *Green,* 399 U.S. at 186 n.20 (Harlan, J., concurring).

84. *Clark-Munoz*, 93 P.3d at 145-46; *Layton City v. Peronek*, 803 P.2d 1294, 1300 (Utah App. 1990); *Cf.*, *Dilliner*, 569 S.E.2d at 223-24 (Starcher, J., concurring) (HGN evidence).

85. *See generally*, *State v. Ford,* 755 P.2d 806, 809-10 (Wash. 1988); *California v. Trombetta*, 467 U.S. 479, 489 n.10, 104 S. Ct. 2528 (1984).

About the Author

Ted Vosk lives in Washington with his wife. He is licensed to practice in the states of Washington and Massachusetts, as well as in the Federal District, Circuit and Supreme Courts. His primary areas of practice are criminal defense, appeals, and consulting. He is a graduate of Harvard Law School and has degrees in both physics and mathematics. Vosk has been named a Goldwater Scholar for his work in physics and mathematics, a Rising Star in criminal law by *Washington Law and Politics* magazine, and is a member of MENSA.

Ted Vosk
Law Offices of Vosk & Velasquez
2135 112th Ave. NE
Ste. 210
Bellevue, WA 98004
425-753-6343
E-MAIL tvosk@comcast.net