
In the Supreme Court of New Jersey

Docket Number 58,879

**STATE OF NEW JERSEY,
Plaintiff-Petitioner,**

v.

**JANE H. CHUN, *et al.*,
Defendants-Respondents.**

**Defendants' Initial Brief after Remand
re Source Code**

TO: Honorable Justices of the Supreme Court of New Jersey
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------------------------------------	-----

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<i>Berger v. U.S.</i> , 295 U.S. 78, 55 S.Ct. 629, 79 L.Ed. 1314 (1935)	60.
<i>Brady v. Maryland</i> , 373 U.S. 83, 83 S.Ct. 1194, 10 L.Ed.2d (1963)	60, 62, 68.
<i>California v. Trombetta</i> , 467 U.S. 479, 104 S.Ct. 2528, 81 L.Ed.2d 413 (1984)	63.
<i>Crawford v. Washington</i> , 541 U.S. 36, 124 S.Ct. 1354 (2004)	56, 58, 67.
<i>Daubert v. Merrell Dow Pharmaceuticals, Inc.</i> , 509 U.S. 579, 113 S.Ct. 2786, 125 L.Ed.2d 469 (1993)	48, 49.
<i>Frye v. U.S.</i> , 293 F. 1013 (D.C. Cir. 1923)	46.
<i>In re LTI Marksman 20-20 Laser Speed Detection System</i> , 314 N.J.Super. 211 (Law Div. 1996)	49.
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<i>Pointer v. Texas</i> , 380 U.S. 400, 403-04, 85 S.Ct. 1065, 13 L.Ed.2d 923 (1965)	55, 56, 67.
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<i>State v. Dorman</i> , 393 N.J.Super. 28 (App.Div.), cert.gr. in part, 192 N.J. 475 (2007) ..	56.
<i>State v. Downie</i> , 117 N.J. 450 (1990)	6, 8.
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<i>State v. Kent</i> , 391 N.J.Super. 352 (App.Div. 2007)	56.
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<i>State v. Renshaw</i> , 390 <i>N.J.Super.</i> 456 (App.Div. 2007)	56.
<i>State v. Storm</i> , 141 <i>N.J.</i> 245 (1995)	61.
<i>State v. Sweet</i> , 191 <i>N.J.</i> 318 (2007)	56-57.
<i>Strickler v. Greene</i> , 527 <i>U.S.</i> 263, 119 <i>S.Ct.</i> 1936, 144 <i>L.Ed.2d</i> 286 (1999)	63.
<i>U.S. v. Agurs</i> , 427 <i>U.S.</i> 97, 96 <i>S.Ct.</i> 2392, 49 <i>L.Ed.2d</i> 342 (1976)	60, 61, 62, 63.
<i>In re Winship</i> , 397 <i>U.S.</i> 358, 90 <i>S.Ct.</i> 1068, 25 <i>L.Ed.2d</i> 368 (1970)	67.

Treatises

-----, <i>Model Rules of Professional Responsibility</i> 3.8, comment (1994)	61.
Hitler, Adolph, <i>Mein Kampf</i> (James Murphy translation, 1933)	10.

Websites

http://encarta.msn.com	2.
http://www.wikipedia.org/wiki/Big_Lie	2
http://www.sourcewatch.org	2

INTRODUCTION

In a case which will set precedent for determining the admissibility of computer-created evidence in criminal prosecutions, this Court is called on to evaluate the scientific reliability of software version 3.11 used to program the Alcotest model 7110 MK-III-C and the admissibility of its results in not only the politically sensitive area of prosecuting alleged drunk drivers but other areas as well.

With unprecedented hubris, Intervenor Draeger Safety Diagnostics, Inc., defrauded the State Police, this Court, and the general public. With lies about reliability based, *inter alia*, on two "independent" technologies -- infrared ["IR"] and electrochemical fuel cell ["EC"] -- coupled with routine calibrations and bracketing control tests, Draeger induced the Attorney General to adopt a device using a computer program so poorly written and so disdainful of generally accepted computer science that, with each revision, the code becomes more and more unreliable and just as likely to convict innocents as to free the culpable.

Compounding Draeger's culture of fraud and concealment is our own Attorney General's culture of calculated ignorance, even in the face of its own expert's assertion of the need for such a review.¹ While the Attorney General's office knew it was embarking into a novel scientific field with equipment dependent on a computer, it failed to consult anyone with the requisite

expertise in computer science, at best a negligent lack of inquisitiveness. They not only failed to see any problems; they did not even look. Once their eyes were opened, they persisted in their strategic blindness by rolling out this flawed technology and increasing backlog pressure.

This Court, in a leap of misplaced faith, required municipal courts to receive this sham as proof beyond a reasonable doubt, disregarding the Constitution with the promise of a stay pending an expedited review of this chimera.

Against these clearly untenable circumstances, we are now faced with managing the aftermath of this Big Lie² told first by Draeger, then repeated by the State. They hope to tell this lie so often that this Court and the public might buy into their propaganda by convicting the inordinate backlog of defendants unjustly charged on incompetent evidence.

In this brief, we urge this Court to dispel the lie and, in the meantime, restart the machinery of justice to right the wrongs already committed before it becomes too late to do so.

¹ 13T52-13/24, 13T53-24/54-4; D-16.

² <http://encarta.msn.com> ("a gross misrepresentation of the facts concerning a major issue, especially for political purposes"), http://www.wikipedia.org/wiki/Big_Lie, <http://www.sourcewatch.org>.

MATTER INVOLVED

On certification assumed *sua sponte* by the New Jersey Supreme Court, pursuant to its Order issued December 14, 2005,³ the Hon. Michael Patrick King, J.A.D. (retired on recall), served as Special Master to conduct hearings on "the reliability of Alcotest breath test instruments...." The Court entered a subsequent Order⁴ on January 10, 2006, addressing municipal court proceedings. After hearings between September 18, 2006, and January 10, 2007, Judge King issued his report on February 14, 2007, which, as to the version 3.11 source code for the Alcotest 7110 MK-III-C, concluded:

- We do not think that this dispute about the source codes has any substantial relevance to our ultimate conclusion, that the Alcotest 7110 instrument is very good at measuring breath alcohol.⁵

- The firmware currently in the Alcotest NJ Version 3.11, and any future modifications or upgrades of that present firmware, does not impact upon or affect the scientific reliability, accuracy or precision of the Alcotest evidential breath test instrument to detect, analyze and accurately report a breath alcohol reading.⁶

This was because Judge King saw "no hint of source code problems or failure throughout this litigation."⁷

However, after oral argument before this Court on April 5, 2007, this Court remained unsatisfied on these points and remanded

³ Da1-4.

⁴ Da5-8.

⁵ SMR45.

⁶ SMR233.

⁷ SMR45.

for the limited purpose of providing defendants the opportunity to conduct, at defendants' expense, an analysis of the software referred to as Firmware version...3.11 used in the Alcotest 7110..., which analysis is to be limited to determining whether Firmware version...3.11 reliably analyze[s], record[s] and report[s] alcohol breath test results....⁸

This Court directed Draeger to provide an independent software house for the purpose of "conducting that analysis...in accordance with the methodology previously agreed upon by defendants and DSDI, as set forth in Addendum A...."⁹ Addendum A, a.k.a. the "Sachs Protocol" and D-232, provides:

This software house will examine the source code *for obvious concerns within the code*, and also *for consistency with the algorithms* as documented in the software.... [and to] certify to the State and the public *that the software properly employs the algorithms* and *that no errors exist* in the source code.¹⁰

When Draeger and Defendants could not agree on a software house, the Court directed them to designate their respective experts to "provide a report ... consistent with the examination and protective aspects contemplated by Paragraph 1 of Addendum A in the Special Master's report...."¹¹ Two examiners were retained, and each issued a report: (a) BaseOne through John Wisniewski,¹² and (b) SysTest through Bruce Geller.¹³

SysTest limited its review to "'obvious issues within the code,' and 'consistency with the algorithms as documented in the

⁸ Da10, *State v. Chun*, 191 N.J. 308 (2007). See Da13-14 denying, *inter alia*, a defense request for funding; see also Da19.

⁹ Da11.

¹⁰ Da15 (emphasis added).

¹¹ Da18.

¹² BaseOne's 57-page report appears at Da20-76.

software...."¹⁴ BaseOne, however, sought to comprehensively review the code for errors.¹⁵ Neither SysTest nor BaseOne exercised the hardware against the software.¹⁶ From their respective examinations, neither examiner could certify that the software properly employs the algorithms or that no errors exist in the source code.¹⁷ SysTest did not even consider this their charge. Thus, without going any further, the State and Draeger have failed to meet requirements established by the Court for making its software admissible.

Nonetheless, after 13 days of supplemental hearings, Judge King found "that the Alcotest is reliable, both as to software and hardware, in reporting alcohol breath testing results for evidentiary purposes,"¹⁸ albeit, "subject to the terms and conditions set forth in the Special Master's initial report and this supplemental report."¹⁹ To the extent that Judge King holds the Alcotest "scientifically reliable," Defendants disagree.

¹³ SysTest's 57-page report appears at Da77-133.

¹⁴ See Da78.

¹⁵ See Da28-29.

¹⁶ See 9TR219-13/220-10.

¹⁷ See Da15.

¹⁸ 2SMR80.

¹⁹ 2SMR6.

COMMENTS ON SPECIAL MASTER'S REPORT

Would Draeger's version 3.11 software in use in its Alcotest 7110 MK-III-C be considered generally acceptable for an important application like evidentiary breath testing? The answer is a resounding, NO,²⁰ for many reasons, including:

- There is no sign of any standard developmental methodology ever being used.²¹ If one were to analogize software development standards to a building code, Draeger's software would be a slapped-together slipshod tumbled-down shack.
- There is no documentation for Draeger's code -- no initial requirements document, no pre-development pseudo-code, nothing.²²
- Draeger's source code is too complex²³ and disorganized.²⁴ As changes are made from one version to the next, errors will be inserted and the code will become more and more unreliable with each revision. This was exemplified with the buffer overflow error.²⁵ It contains blind alleys within a maze of unused, walled-off, and errant code.²⁶
- The range of accepted deviation between breath samples was increased to mask potential error.²⁷ In New Jersey, the legal standard for agreement of results from two breath samples was .01,²⁸ then 10 percent.²⁹ That increased to the greater of .02 or 20 percent,³⁰ effectively eliminating any need for requiring third test verification.³¹

²⁰ 9RT187-5/19.

²¹ See Da32 (BaseOne p.13), Da145 (Workman p.3).

²² Da47 (BaseOne p.28), Da145 (Workman p.145).

²³ 9RT200-20/201-7, see Da146 (Workman p.4).

²⁴ See Da33 (BaseOne p.14).

²⁵ Exh.DR-4, see 10RT59-6/8.

²⁶ See Da43 (BaseOne p.24).

²⁷ See 34T87-6/10

²⁸ See *State v. Downie*, 117 N.J. 450 (1990); *Romano v. Kimmelman*, 96 N.J. 66 (1984).

²⁹ 38T86-17/88-2.

³⁰ 10RT51-21/52-8, 52-22/25, 55-23/56-1; see 9T26-11/16. See *State v. Foley*, 370 N.J. Super. 341, 355 (Law Div. 2003).

³¹ See, e.g., Da203-04; see also 10RT51-21/52-8, 52-22/25, 55-

- There are no metrics and insufficient data on which to base a reliability determination.³²

Furthermore, both SysTest and BaseOne found specific problems in the code that raise serious questions as to its reliability, including the disabling of fundamental safeguards, incorrect functions as fundamental as averaging, arbitrary substitution of data values at various points, and forcing drifting fuel cells to agree with the IR sensors, thereby exposing the lie to the claim that these two technologies, IR and EC, cross check and verify each other. These and other "Show Stoppers" are discussed elsewhere herein.

I.
Version 3.11 Is Riddled with Error:
A Hidden Fuel Cell Manipulation Software Routine
Renders the Alcotest Scientifically Unreliable

Lint, a software tool designed to discover potential coding errors, found more than 19,000 defects in the Alcotest source code.³³ While the probability that any single random defect will cause a failure in a breath test is low, the thousands of defects here increase that probability quite significantly.³⁴ Such random errors could manifest themselves as, *inter alia*, high readings, low readings, a report of an insufficient sample which the

23/56-1.

³² 9RT211-21/212-25.

³³ 8RT24-9/11.

³⁴ 9RT224-13/225-1.

Alcotest should accept, or missing data.³⁵ They can arise from a number being written as a letter.³⁶

No source code is perfect.³⁷ Judge King recognized that software errors exist.³⁸ A number of anomalies exemplify error:

In the case of Alberto C. Gonzalez,³⁹ he was tested by the same officer on May 15, 2006, in East Brunswick, Milltown, and South River⁴⁰ at 4:03, 4:36, and 5:14 a.m. Eastern Daylight Time, respectively.⁴¹ Although apparently exonerated by his first to breath tests, the officer persisted in his belief that Gonzalez was culpable.⁴² His errors would have never come to light but for being tested on the same night on three different machines,⁴³ all using the same source code -- New Jersey version 3.11.⁴⁴

Another alcohol influence report in New Brunswick reported a .13 despite preliminary results ranging from .139 to .169.⁴⁵ This anomaly, which contravenes the requirement that two separate breath samples yield results within 0.010 of each other expressed in prior New Jersey case law requirements,⁴⁶ was not unique.⁴⁷

³⁵ 9RT225-2/24; see, e.g., Exh.AB-2; see also 10RT65-2/7.

³⁶ See, e.g., 10RT66-11/67-9; see also Da57.

³⁷ See 2SMR52.

³⁸ See 2SMR78, 107.

³⁹ See Da201-206 (Exh.D-197).

⁴⁰ 10RT, 9-16/19, 11-14/25.

⁴¹ 10RT14-20/22.

⁴² Cf., from 2006 hearing, e.g., Da275-76 (Exh.D-149, 0.02), Da277 (Exh.D-150, 0.00), Da282 (Exh.D-153, 0.03), Da291-92 (Exh.D-155, 0.04), Da296 (Exh.D-155, 0.03), Da303 (Exh.D-155, 0.01), Da311 (Exh.D-157, p.2, 0.04), Da313 (Exh.D-157, p.8, 0.02).

⁴³ 10RT12-1/24.

⁴⁴ 10RT42-7/43-21.

⁴⁵ Da207-08 (Exh.D-8); see 10RT48-23/49-19, 50-15/24.

⁴⁶ See *Romano v. Kimmelman*, *supra*, and *State v. Downie*, *supra*.

⁴⁷ See, from 2006 hearings, e.g., Da211-12 (Exh.D-13, .030 apart),

Yet another is the example in the alcohol influence report from Longport,⁴⁸ where a test result reported despite the omission of key information concerning simulator solution lot number, expiration date, and bottle number. Other anomalies include:

- Accepting clearly erroneous data, yet reporting apparently valid results.⁴⁹
- Accepting breath samples less than two minutes after a previously submitted sample,⁵⁰ even though New Jersey version 3.11 requires a two minute lockout between breaths.
- EC and IR results more than .008 apart⁵¹ -- again, beyond stated program limits.
- A report that "Subject Refused" as an error message for an individual sample rather than as the reported result at the

Da217-18 (Exh.D-61, .014), Da230-31 (Exh.130, .144), Da235-36 (Exh.D-135, p.2-3, .030), Da237 (Exh.136, p.1, .013), Da242-43 (Exh.140, .014), Da268-69 (Exh.D-145, .024), Da270-71 (Exh.D-146, .024), Da272-73 (D-147, .030), Da274 (Exh.D-148, .026), Da278-79 (Exh.D-151, p.8-9, .023), Da280 (Exh.D-151, p.13, .012), Da281 (Exh.D-152, .011), Da282-83 (Exh.D-153, .014), Da286 (Exh.D-154, p.4, .014), Da287-88 (Exh.D-154, p.6-7, .011), Da289-90 (Exh.D-154, p.9-10, .011), Da293-94 (Exh.D-155, p.3-4, .013), Da295 (Exh.D-155, p.5, .012), Da301-02 (Exh.D-155, p.12-13, .012), Da304 (Exh.D-155, p.16, .018), Da305 (Exh.D-156, p.4, .013), Da306-07 (Exh.D-156, p.5-6, .012), Da308-09 (Exh.D-156, p.7-8, .011), Da312 (Exh.D-157, p.6, .021).

⁴⁸ Da318 (Exh.AB-3), see 10RT102-22/104-6; see also, from 2006 hearing, e.g., Da264-65 (Exh.D-143).

⁴⁹ See Da221-29 (Exh.D-63) (In Milltown, CU-34 type listed incorrectly as "4" rather than correctly as "WET"), Da244-63 (Exh.D-142) (In Princeton Borough, serial number listed incorrectly as "4" rather than correctly).

⁵⁰ See, from 2006 hearing, e.g., Da209-10 (Exh.D-12, once in three attempts), Da219 (Exh.D-62, once in two), Da240-41 (Exh.D-137, once in three), Da266-67 (Exh.D-144, once in four), Da278-79 (Exh.D-151, p.8-9, twice in five), Da284-85 (Exh.D-154, p.1-2, once in four), Da286 (Exh.D-154, p.4, once in four), Da297-98 (Exh.D-155, p.8-9, once in four), Da299-300 (Exh.D-155, p.10-11, twice in five), Da306-07 (Exh.D-156, p.5-6, twice in four), Da310 (Exh.D-157, p.1, once in three), Da314-15 (Exh.D-157, 9-10, once in nine).

⁵¹ See, from 2006 hearing, e.g., Da217-18 (Exh.D-61).

end of the entire testing sequence.⁵²

- Calling an apparently disabled "Control Gas Supply" error.⁵³
- Reporting an inappropriate "Ambient Air Blank" as "----" rather than a correctly formatted numerical value of "0.000%."⁵⁴

But we should distinguish between such apparently random defects and errors discussed above and the dishonest data manipulation and serious coding errors discussed below -- any one of which, in and of themselves, alone and in concert, undermine reliability to such a degree that this Court should exclude all Alcotest results. These include the Big Lie about EC and IR technologies verifying each other.

Fuel Cell Drift Exposes the Lie to Draeger's Claim that Independent Technologies Verify Each Other and Assure Reliability

When telling the Big Lie, it has been said, "Make the lie big, make it simple, keep saying it, and eventually they will believe it."⁵⁵ Draeger's "Big Lie" about the Alcotest 7110 MK-III-C is its alleged used of independent technologies to analyze a single sample:

- [I]t's the only instrument on the market...that is capable of...analyzing and quantifying the alcohol concentration of the same specimen by two independent technologies. This has added a significant amount of integrity to the testing result of this type of process.⁵⁶
- [I]s this instrument scientifically reliable[?] [T]he instrument performs this task correctly within the

⁵² Da242-43 (Exh.D-140).

⁵³ Da316-17 (Exh.S-61).

⁵⁴ Da216 (Exh.D-60), cf. Da219 (Exh.D-62).

⁵⁵ Hitler, Adolph, *Mein Kampf* p.134 (James Murphy translation, 1933).

⁵⁶ 20T21-10/21-17 (Ryser).

specified tolerances and...it does this twice, actually, with two independent technologies.⁵⁷

- [I]t is doubling the integrity of the tests performed that you have two independent technologies analyzing the same specimen.⁵⁸
- [W]e produce actually two independent readings by measuring the same specimen....⁵⁹

Others unwittingly repeated the lie as if true:

- The Hon. **Francis J. Orlando**, A.J.S.C.: "The 7110 is an evidential breath testing instrument which uses infrared (IR) absorption analysis and electrochemical (EC) cell technology analysis to simultaneously determine the presence of ethanol in a breath sample. Each method of analysis operates independently."⁶⁰
- NHTSA's **Edward Conde**: "It is a bench-top breath alcohol device that uses dual sensors, an infrared and a fuel cell sensor, to come up with independent measurements of breath alcohol content on the breath."⁶¹
- State's Witness **Rod G. Gullberg**: "The 7110 plays two separate, independent analytical methods...."⁶²
- Then Chief Forensic Scientist **Thomas A. Brettell**, Ph.D.: [For an accepted breath tests, the EC is independent of the IR, correct?] "Yes, they're independent measurements, yes."⁶³
- Brettell**: "Well, dual -- independent measurements are two measurements independent of each other using different technologies, independent technologies, okay. There's different ways to do that. You can take one sample and put it in the IR and take another sample and put it in the EC. That's not how this instrument works. This instrument measures one breath sample with two different technologies and it's the same stream of breath. It's not a different stream of breath."⁶⁴

⁵⁷ 20T48-19/49-4 (Ryser).

⁵⁸ 23T85-8/85-12 (Ryser).

⁵⁹ 50T31-18/20 (Ryser).

⁶⁰ *State v. Foley, supra*, 370 N.J. Super. at 346.

⁶¹ 1T85-6/85-10.

⁶² 12T59-5/6.

⁶³ 37T166-10/166-13.

⁶⁴ 42T14-5/15-12.

- Dep. Atty. Gen. **Stephen H. Monson**: "What essentially is new or novel... is that you have both systems in the same instrument measuring the same sample of breath as a dual system.... But each one is measuring independently...."⁶⁵

Shaffer, after persistent cross examination,⁶⁶ exposed the lie:

- During the control tests, when we're assured that we are looking at ethanol standards only, no interfering substances, the fuel cell *does have an awareness* of where it is in relation to the IR sensor.⁶⁷

Wisniewski verified the lie's existence. At defense request after Shaffer's revelation, Wisniewski found the lines of source code where the software routine makes the EC reading a function of the IR reading, reproducing it in an exhibit, DR-14, and explaining it in detail.⁶⁸ **Workman** explained how the lie works:

- This adjustment basically says that the EC value is going to be calculated using the IR value....⁶⁹ The effect of that defect is to corrupt the ability to tell whether the two results are close or not because they'll always be close....⁷⁰ It substitutes IR values in the calculation of EC values.⁷¹
- To a scientist, [using the interaction of the infrared and electrochemical technology as something that verifies the reliability of an alcohol influence report result is] probably the ultimate insult to the science because the machine is designed so that if the EC and IR differ by more than a certain amount, that is the mechanism by which the machine detects problems.⁷²
- By comparing the EC and the IR. Those are supposed to be very close together. And, in fact, the code snippet that Base One produced shows that when the EC is out of

⁶⁵ 70T33-7/12.

⁶⁶ 5RT220-2/231-5.

⁶⁷ 5RT224-11/14 (emphasis added); see also 5RT226-19/24, 227-17/21, 230-6/13.

⁶⁸ 8RT187-9/19, 189-20/197-7.

⁶⁹ 10RT137-5/6.

⁷⁰ 10RT138-22/24. See discussion re "soll_aak" file at 10RT138-12/139-9.

⁷¹ 10RT140-18/19.

⁷² 10RT132-10/133-2.

tolerance...the value from the IR is used to re-calibrate the EC. So, what you have is a dependent function, not an independent function.⁷³

- We talk about data pollution sometimes, which you might imagine is not a good thing, but when you have two functions that are supposed to be independent and they use variables that are calculated from the other area, you cannot have independence. It's a dependent function.⁷⁴

Judge King even understood the lie:

- Never once did they ever mention that there was this interrelationship of dependence between IR and EC values, so this comes as somewhat of a surprise. All of a sudden this battery is dying inch by inch and they got to get a little juice from someplace else to make it fit into the grand scheme. Now, I must admit I'm terribly cynical based on all my experience, but it's starting to sound a little funny.⁷⁵
- And this statement here which was emphasized by counsel about two independent examinations. And this was the big selling point for Draeger, inherently entirely corroborative, independent test, and Hans Ryser describes how we take a bite out of the sample in the cuvette and run it through this completely independent process. Meanwhile, I see this fuel cell limping along.⁷⁶

Inexplicably, Judge King abandoned this well-grounded and inquisitive cynicism to become Draeger's apologist, ignoring the essential point: that manipulation of fuel cell drift completely undermines reliance on the Alcotest's allegedly most important feature. The revelation was a seminal moment in the remand hearing. Testimony confirmed that a previously unknown algorithm in the source code manipulates the output of an aging fuel cell to bring it within tolerance of the IR during control tests.⁷⁷

⁷³ 10RT133-3/18.

⁷⁴ 10RT132-20/133-8, 137-8/15; see Exh.DR-14.

⁷⁵ 12RT39-21/40-4.

⁷⁶ 12RT40-9/19.

⁷⁷ See 5RT220-2/231-5; 6RT104-14/112-5, 125-17/126-24, 129-10/131-

Whether one calls this manipulation a fuel cell aging compensation routine,⁷⁸ fine tuning,⁷⁹ or adjustment,⁸⁰ there was no evidence concerning the frequency by which this manipulation occurs. Nonetheless, this manipulation completely undermines previous reliance on the two most important features of New Jersey's Alcotest program: the so-called independent dual technologies utilizing EC and IR for measuring alcohol and (b) using control tests both before and after each subject's breath tests as a basis for ensuring reliability.

The Lie About Independent Technologies

Fuel cell drift requires that the EC result be manipulated periodically to conform to the IR result during a subject's testing sequence. Such drift puts the lie to Draeger's longstanding claim that the Alcotest is the only breath testing device in the world that employs two independent technologies to measure alcohol in a single sample. Draeger also claims that its primary competitors do not.

In *State v. Foley*,⁸¹ the first published opinion on supposed Alcotest reliability, Judge Orlando relied on Draeger's representations about EC/IR independence seven times.⁸² A most salient example was Judge Orlando's repetition of the lie quoted above. Similarly, each State's expert last year opined that the

4; 8RT182-14/199-3; 10RT129-1/6, 132-10/146-11, 149-1/17, 232-9/234-9, 241-15/243-13, 249-6/254-5.

⁷⁸ 6RT129-21.

⁷⁹ 10RT233-13.

⁸⁰ 5RT227-21.

⁸¹ 370 *N.J. Super.* 341 (Law Div. 2003).

allegedly independent dual technology in the Alcotest provided a foundation for reliability. Yet no testimony was advanced to cast doubt on this flawed premise. Judge King's initial report trumpeted the Alcotest independent dual technology no less than seven times.⁸³ Now, he does acknowledge the falsity of these claims by Draeger.⁸⁴

The Lie About Control Tests

Likewise, the control test aspect of New Jersey's Alcotest program is viewed as an additional and essential part of the foundation for Alcotest reliability. Unlike the Breathalyzer's periodic inspections with a known solution of alcohol often performed months apart, Alcotest control tests use the solution as an accuracy safeguard both before and after each subject's breath tests to bracket and assure reliability via the sequence of an ambient air check to detect any atmospheric contaminants, the control test, another ambient air check, breath test one, an ambient air check, breath test two, an ambient air check, a second control test, and a final ambient air check.⁸⁵

Every State's expert approved of New Jersey's use of control tests and testing sequence as fundamental to ensuring reliability. For example, State's expert Barry K. Logan, Ph.D., testified:

It helps to insure that you can state with confidence the instrument is measuring accurately and

⁸² See *id.*, 370 N.J. Super. at 345-47, 351, 356, and 359.

⁸³ See SMR33, 52, 67, 75, 177, 186, and 252.

⁸⁴ See 2SMR84.

⁸⁵ See SMR42.

reliably at the time of the subject's test. The instrument will accurately measure a breath sample that is provided to it and the control sample that is provided to it providing all the standards or criteria for the test are met.⁸⁶

More significantly, Dr. Brettel, the overseer of New Jersey's Alcotest program, testified extensively about the importance of the control test procedures:

- The control test makes sure the instrument is operating properly...with a known concentration of ethanol vapor.⁸⁷
- We have a control test on the instrument so that, you know, it's--the instrument is checking itself every test, every subject test.⁸⁸
- [W]e run control tests. You know, when we run the control tests, we run two control tests, so if there's something wrong with the instrument it shows up in the control test.⁸⁹
- Q. You don't know whether there's anything in the source code that may be self-correcting or self-calibrating, fair enough? A. No, I do know that. We run control tests. We're checking the calibration twice on every subject test, so I do know that the instrument's not doing that.⁹⁰

Careful review of the testimony of each State's expert who offered an opinion last year concerning Alcotest control tests reveals no awareness of fuel cell drift or its manipulation during control tests. The experts considered the independence of the IR and EC to be sacrosanct. Thus, previous reliance by the *Foley* court, Judge King, and every expert witness on the so-called independent dual technologies and the institutional safeguard represented by control tests as a basis for finding

⁸⁶ See 5T69-4/69-10.

⁸⁷ 33T81-1/4.

⁸⁸ 35T110-1116.

⁸⁹ 37T:15-4 to 15-11.

⁹⁰ 37T156-13/18.

Alcotest reliability is torn asunder and must be reconsidered and disregarded. One cannot assume that the experts would still support Alcotest reliability, given the ramifications of fuel cell drift. Expert opinions rendered in both the *Foley* hearings in 2003 and the *Chun* hearings last year would be substantively different concerning overall reliability if fuel cell drift correction algorithm was known.

Judge King's Remedy Is Unsupported

Even after disclosure of this algorithm, Judge King proposes a remedy unsupported by any evidence in the record. After referring to fuel cell drift throughout his report,⁹¹ Judge King specifically but arbitrarily recommends "that the Alcotest should be calibrated every six months rather than every twelve months and the fuel cell replaced at that time, if necessary."⁹² No testimony shows that either a six month calibration or annual fuel cell replacement would solve the problems presented by the need to correct for fuel cell drift. Draeger's own software engineer rejected such a proposal:

Q. And if the fuel cell changes over time, it would be more accurate to do it on the lower end like the six months rather than the 12 months, correct?

A. I -- I disagree. Because of the aging compensation routine that we were talking about yesterday, that's the reason that -- that Germany put that algorithm within the code.⁹³

Moreover, no evidence supports the notion that more frequent calibration will alleviate concerns associated with fuel

⁹¹ See 2SMR13, 15-16, 47, 57-58, 61-61, 76-78, and 81-84.

⁹² See 2SMR84.

cell drift. The testimony is silent concerning the frequency by which the fuel cell aging compensation algorithm in the source code is activated to manipulate the control tests. Draeger never supplied or published any studies regarding how a fuel cell drifts and degrades. Without such evidence, Judge King's recommendation is merely net opinion -- an abstract suggestion that ignores the fundamental facts that (a) fuel cell drift will occur after an Alcotest is placed in service and (b) its output will be manipulated to make its result match the IR result. No contrary evidence was introduced below that adduced otherwise.

Furthermore, Judge King's conclusion -- that "the standard of measurement is adjusted for fuel cell depletion, not for any other alcohol content" -- is a fallacy which lays bare the most important consequence of fuel cell drift. The same fuel cell manipulated output used in the first control test is the same fuel cell manipulated output used to measure a defendant's breath sample two minutes later in New Jersey's breath testing sequence. Once the fuel cell reading is manipulated in the control test to account for fuel cell drift, it will affect every ensuing measurement by the Alcotest.

Neither a six- nor 12-month calibration can hide this most basic truth. As soon as manipulation occurs, every succeeding measurement relies on the prior fuel cell manipulation even though the fuel cell continues to drift unabated.⁹⁴ Therein lies

⁹³ 6RT105-3/9.

⁹⁴ 50T27-6/9 (Ryser).

the overarching conundrum presented by fuel cell drift. The most galling aspect of fuel cell drift manipulation is that Draeger had never revealed its use to anyone before.

Draeger's History of Concealment

Draeger's discussions with New Jersey about replacing the Breathalyzer with the Alcotest for evidential use in drunk driving prosecutions date back to 1995. In 1998, Draeger provided the first Alcotest to the New Jersey State Police. The parties entered into a software licensing agreement in September 2002.⁹⁵ Camden County held the first Alcotest reliability hearing in 2003. This extensive hearing resulted in the *Foley* opinion. Four State's experts and one defense expert testified during *Foley*.⁹⁶ There was no mention of manipulation of fuel cell drift in any Draeger manual or document in *Foley* or the *Foley* opinion.

Substantive changes to the Alcotest software occurred by virtue of the *Foley* hearing and resultant opinion. Manuals concerning its use and operation specific to New Jersey were updated to comport with such changes. Still, Draeger never disclosed the existence of fuel cell drift manipulation.

In January 2005, the State began evidential use of Alcotest firmware 3.11 in Middlesex County for drunk driving prosecutions, leading to the current *Chun* litigation which spawned a four month hearing before Judge King between September 2006 and January 2007. Eleven State's experts and two defense experts testified

⁹⁵ See SMR50.

⁹⁶ See *State v. Foley*, *supra*, 370 N.J. Super. at 350-351.

during this lengthy hearing. Draeger's counsel participated in this hearing. Draeger's vice-president for marketing testified three times in seven days. Still, there was no mention of fuel cell drift manipulation. Although this expert witness was questioned by the defense about fuel cell drift caused by aging, the existence of an algorithm to manipulate the EC to account for fuel cell drift was never disclosed.

Following the four month hearing, Judge King issued his 268-page report. Extensive briefs were submitted to the Court including a 16-page brief by Draeger's counsel. On April 5, 2007, nine attorneys, including Draeger's counsel, argued before this Court. Still, no mention was made of manipulation of fuel cell drift. After oral argument, the Court issued two remand Orders resulting in separate examinations of the Alcotest source code. One such review was performed by a software house both selected and paid by Draeger. Both examinations yielded lengthy reports to the Special Master. Still no one mentions fuel cell drift manipulation.

During the foregoing entire process, the Alcotest replaced Breathalyzers for evidential use in drunk driving prosecutions in 17 of New Jersey's 21 counties. No defendant, municipal court judge, municipal prosecutor, defense attorney or any other entity except Draeger was aware of the existence of an algorithm within the source code to manipulate fuel cell drift.

Judge King ordered an additional testimonial hearing after receiving BaseOne's and SysTest's reports. During the first week

of the remand hearing, two experts testified for the State concerning the Alcotest source code. Still, no one mentions fuel cell drift manipulation. Draeger's software engineer ultimately reveals the fuel cell drift manipulation during defense cross-examination in the second week of the remand hearing.

Judge King does not mention this in his 108-page report.

Twelve years elapsed from Draeger's first discussions with New Jersey about the Alcotest to disclosure of fuel cell drift and fuel cell drift manipulation during defense cross-examination in the remand hearing. Surely, there was a deliberate effort by Draeger to keep secret the existence of fuel cell drift manipulation for the Alcotest in New Jersey. Judge King fails to mention this calculated concealment in his supplemental report.

Significantly, the State was not made aware of fuel cell drift by Draeger. During summation, Dep. Atty. Gen. Christine A. Hoffman admitted:

I do understand the Court's concerns. I was as surprised as the Court. I was away on vacation. I was quite shocked to see in the transcript that this is being done.

So this was the first time the State of New Jersey knew about it.⁹⁷

Draeger's counsel proclaimed no such surprise about fuel cell drift manipulation in his summation. Draeger's affirmative and deliberate efforts to mislead us, this Court, the Special Master, the Attorney General, the municipal courts, and every citizen affected by Alcotest evidence about the existence of fuel

⁹⁷ 12RT43-4/9.

cell drift should not be countenanced. To conclude otherwise would be tantamount to accepting stonewalling and deliberate deception as acceptable tenets of New Jersey criminal practice. This Court has always recognized that full disclosure is a prerequisite to the ascertainment of truth. Such a search for the truth has always been the legal foundation by which the adversarial process insures due process in the context of criminal practice.

II.

Version 3.11 Is Riddled with Error: “Show Stoppers” like, *inter alia*, Disabled Catastrophic Error Detection, No Positive Feedback, and Expanded Agreement Criteria, Whether Alone and in Concert, Render the Alcotest Scientifically Unreliable

Disabled Catastrophic Error Detection Leads to Unpredictable Results

Catastrophic error detection,⁹⁸ which encompasses illegal operational code [“opcode”], is a hardware function resident in the microprocessor “brain” of the Alcotest. John Wisniewski discovered that this safeguard function is disabled in the Alcotest by the present source code. If there is a major fault that happens in the processing of the data by the microprocessor the instrument doesn't necessarily shut down. Mr. Shaffer hypothesizes that it might shut down but can not definitively conclude that it does. He explains that a catastrophic error occurs when the microprocessor loses its way, and the Alcotest

⁹⁸ See Da23, Da37 (BaseOne p.4, 18); Da147 (Workman p.5).

can report improper data. Shaffer, conceding that disabling catastrophic error detection is not a good idea, went so far as to consult Draeger personnel in Germany during the hearing to verify that it could be re-enabled.⁹⁹

Without Positive Feedback, Software Assumes but Does Not Verify Hardware Actions

Positive feedback is directly verifying that a computer command issued by the microprocessor is executed by the hardware. The Alcotest has no positive feedback,¹⁰⁰ except in one isolated instance. As Wisniewski explained by the BaseOne report, the need for positive feedback can be analogized to the landing gear on an aircraft. The pilot gives the onboard computer a command, and the computer sends a signal to the landing gear to deploy. A sensor detects the actual opening of the landing gear and sends that information back to the computer, which then notifies the pilot that the landing gear has actually deployed.

In the Alcotest, the microprocessor, in most instances, gives instructions to the hardware to perform certain functions. Most of those functions are not monitored directly to see whether they happen. They're just assumed to happen. Alcotest hardware is told pump, purge, fill the EC cell, and time a certain period, but almost none of this is directly measured.

Draeger contends that the Alcotest indirectly checks mechanical functions. That is like contending that, in an airplane, someone in Seat A of Aisle 42 is going to look down and

⁹⁹ 6RT36-7/10, 98-12/99-3.

notice that the landing gear has not deployed and then report it to the pilot. That is not positive feedback. This is a problem with the instrument itself. This hardware issue was discovered only because the software was examined during the source code inspection before the remand hearing.

The plane crashing because the landing gear did not deploy is also indirect feedback, but hardly acceptable. Neither is accepting a breath tester that yields either inculpatory evidence against an innocent defendant or exculpatory evidence against a guilty accused.

Failed Diagnostics Force Software to Adjust and Substitute Data for Breath Measurements

The software adjusts and substitutes data readings if a reading is too high or too low.¹⁰¹ If the reading is outside what the software considers the proper range, the software takes a too high or too low reading and forces it into the range. This essentially falsifies the resultant reading.

Inconsistent Error Detection Logic Suppresses Error Messages Unless the Error Occurs a Large Number of Times

The error detection logic in the software ignores what it clearly assesses as improper data readings unless it occurs more than 31 times in a row.¹⁰² There can be 31 consecutive times that the computer interrogates the hardware and gets what is considered an error, and it will still not report it as such. Only on the 32nd time is an error reported.

¹⁰⁰ See Da23, Da37 (BaseOne p.4, 18).

¹⁰¹ See Da23, Da37 (BaseOne p 4, 18); Da146 (Workman p.4).

The characterization of using only one of 32 samples as a fault-tolerance is misleading and incorrect, since fault-tolerance depends on alternate sensors like those in an aircraft.¹⁰³ "The whole concept of fault tolerance is not to use bad values. It's to find an alternate way to compute the results so that they're correct. The notion of ignoring 31 consecutive errors and using the data that are computed with those 31 values is...bad science. It's junk science."¹⁰⁴ "The 7110 ignores the fact that errors have occurred, calculates what the faulty value is, and then produces wrong results...the antithesis of fault tolerance."¹⁰⁵

Incorrect Averaging Algorithm Is Not Scientifically Valid and Improperly Weighs Last Measurement

The so-called averaging algorithm is not an average at all.¹⁰⁶ The improper calculation invalidates the science underlying breath alcohol testing.¹⁰⁷ Workman never encountered a formula like this used in any equipment he had ever seen.¹⁰⁸

The calculation adds two values; that sum is added to a third value, and that sum is divided by two; that sum is added to a fourth value, and that sum is divided by two; and so on.¹⁰⁹ It is not a weighted average, which simply accounts for the

¹⁰² See Da24, Da40 (BaseOne p 5, 21); Da146 (Workman p.4).

¹⁰³ 10RT128-5/129-6.

¹⁰⁴ 10RT130-13/18.

¹⁰⁵ 10RT130-5/11.

¹⁰⁶ 10RT78-12/15; see Da36 (BaseOne p.17), Da146 (Workman p.4).

¹⁰⁷ 10RT69-17/70-1, 77-8/14, 79-2/4, 86-25/87-11, 121-17/122-7.

¹⁰⁸ 10RT83-6/13, 87-16/23.

¹⁰⁹ 10RT71-6/18; see 10RT72-15/73-8; see also DR-19, DR-20.

distribution of repeated variables¹¹⁰ but is still like an arithmetic average based on the associative property of numbers taught in elementary school.¹¹¹ Draeger knows what an average is and how to use it.¹¹² They didn't do it here, but rather adopted a method of increasing results not based in science.

Analog to Digital Conversion Routines Reduce Accuracy and Precision

Analog to digital conversion involves sampling points on an analog sine wave to develop, through semiconductor chips, a digital approximation of the wave form generated by a voltage that the computer can process as a binary signal.¹¹³ The sampling occurs at an interrupt every 8.192 milliseconds, and the sample is read into the software, which makes the impulse available as a number for the source code to use to make computations about the breath alcohol level.¹¹⁴ With the current program, 31 of 32 samples can be wrong, and "one may count for the entire ball of wax,"¹¹⁵ thus calling the reliability of the ultimate result into question.¹¹⁶ Although viewing the wave form provides a way to diagnose problems, there is no way for the Alcotest to display the wave form.¹¹⁷ Yet copiers and cars often log wave forms.¹¹⁸

¹¹⁰ 10RT80-22/3; see DR-23.

¹¹¹ 10RT83-1/8.

¹¹² See 10RT83-14/21, 84-15/85-21; see also Exh.CR-3.

¹¹³ 10RT124-2/126-6.

¹¹⁴ 10RT126-10/19.

¹¹⁵ 10RT118-1/6.

¹¹⁶ See Da36, Da40 (BaseOne p.17, 21).

¹¹⁷ 10RT126-24/127-10.

¹¹⁸ 10RT127-18/24.

Buffer Overflow Compromises Reliability of Test Sequences Requiring Third Samples (Although Such Sequences Would Rarely Present Themselves Given the Extraordinarily Wide Agreement Between Results Accepted by Version 3.11)

This buffer overflow was an inadvertent error inserted into the source code when Shaffer failed to change the number of registers needed to track breath test results from four to six.¹¹⁹ This error would present itself when the second EC value is less than .08 by substituting another value.¹²⁰ While SysTest identifies this clearly apparent error,¹²¹ the error is, in reality, inconsequential, given the extraordinary widening of the permissible range within which the results from two breath samples are deemed acceptable. It is as if SysTest identified this one and only obvious error so that they could simply say they found something. The buffer overflow is the straw dog offered by an organization that performed only a cursory review.

Other Concerns Raised by BaseOne Undermine Alcotest Reliability

Other notable errors and defects include (a) unsynchronized timing intervals running at fixed points rather than from the latest request for a time delay which lead to actual timing that is highly variable and inconsistent¹²² and (b) the making of airflow measurements with no reasonableness testing or quality checks, further undermine confidence in calibration¹²³ already compromised by the fuel cell manipulation noted above. BaseOne's

¹¹⁹ Exh.DR-4; see 9RT229-24/232-5.

¹²⁰ 9RT232-9/13, see 9RT235-24/235-8.

¹²¹ See Da78-79 (SysTest p.3-4), Da81 (SysTest p.81).

¹²² See Da41-42 (BaseOne p.22-23).

¹²³ See Da24, Da37-38 (BaseOne p.5, 18-19).

examination raised so many errors and defects, Draeger's source code cannot be found reliable without an extensive rewrite.

III. Faulty Software Design Renders Draeger Source Code Unreliable

Software Fails to Adhere to Any Discernable Standard, Leading to Unreliable, Error Prone Code

Alcotest source adheres to no discernable standard.¹²⁴ The basic method of testing source code is to first test at the module level -- *i.e.*, to test the facilities within a particular routine -- before testing at the integrated software package.¹²⁵ No quality assurance organization exists within Draeger.¹²⁶ The Alcotest 7110 cannot be used for medical purposes in that it fails to meet Food and Drug Administration standards.¹²⁷

Draeger's Ryser testified about a rigid distinction in the source code between (a) "core software"¹²⁸ which pertains to the breath test calculations and is never touched, and (b) "custom software"¹²⁹ tailored for each jurisdiction to report and format the readings. Based on good practices, as attested to by Wisniewski and Workman, core and custom software should be delineated in a very distinctive way in the software to prevent inadvertent modification.

¹²⁴ See Da32, Da35 (BaseOne p.13, 16); Da145 (Workman p.3). See also Da79 (SysTest p.4).

¹²⁵ 9RT213-6/9.

¹²⁶ 10RT35-8/20.

¹²⁷ See 21 C.F.R. 862.3050, see also www.accessdata.fda.gov.

¹²⁸ D-99.

Unfortunately Mr. Shaffer, testified that he was "told" what he was not supposed to touch, so he "kind of walls it off in his mind."¹³⁰ When is that ever acceptable, in an evidential instrument? Shaffer testified as to how he accidentally inserted the buffer overflow error. What protects the core software from such inadvertent error insertion in the core software?

Highly Complex Coding Leads to Error Insertion and Degradation on "Upgrades" and, with Excessive Use of Global Variables, Further Compromises Reliability

Alcotest source code is much too complex.¹³¹ Complexity invites error both in the original coding and in updates to the present code. Both SysTest and BaseOne found complexity to be a real problem undermining any finding of reliability.¹³²

Based on McCabe complexity metrics, complexity levels should exceed no more than 10, with a level of less than 7 recommended, according to SysTest.¹³³ After all, software engineers, being human beings, can only track so many things at one time.¹³⁴ With most of Draeger's source code modules well exceeding this level, the code is prone to corruption and unpredictable execution.¹³⁵ Indeed, one snippet of the code produced by the version 3.11 proponents shows how Draeger's programmer Shaffer unintentionally inserted error when he

¹²⁹ D-101.

¹³⁰ 6RT28-22/29-2.

¹³¹ See Da22-23, 40 (BaseOne pp.3-4, 21); Da146 (Workman p.4); Da81-82, Da97-98 (SysTest pp.6-7, 22-23).

¹³² 9RT195-8/19.

¹³³ 9RT195-20/197-17, see 9RT199-12/200-5.

¹³⁴ 10RT97-9/98-2.

¹³⁵ See 9RT200-20/201-7.

"upgraded" the source code from version 3.8 to 3.11 by failing to correct buffer capacity and thereby creating the famous buffer overflow.¹³⁶

The prospect of error insertion is very real, given that source code revisions must be made to the present program to account for several factors, including:

- Changes in the law,¹³⁷ including the change in Daylight Savings Time.¹³⁸
- The need to list the temperature probe serial number and probe value of that temperature probe on any report where such information is relevant, including the AIR, New Standard Solution Change Report, and Calibration, Control Test, and Linearity Reports.¹³⁹
- The need to "deploy a software program to create and maintain a centralized data base of digital information stored by all Alcotest 7110s throughout the State."¹⁴⁰

Further changes to source code will be inevitable as the law and other circumstances change.¹⁴¹

Adding to this complexity is the presence of an excessive number of global variables.¹⁴² A programmer should properly encapsulate data to avoid inadvertent destruction of data.¹⁴³ "The real sad thing here is that if global variables had been

¹³⁶ Exh.DR-4.

¹³⁷ 9RT201-15/19.

¹³⁸ 9RT201-20/25, 10RT88-2289-3; see 10RT90-6/24.

¹³⁹ 53T35-25/36-20.

¹⁴⁰ SMR247; see 9RT207-11/20.

¹⁴¹ See 9RT201-13/25.

¹⁴² 10RT34-5/6. See Da40 (BaseOne p.21); Da146 (Workman p.4). See also Da86 (SysTest p.10).

¹⁴³ 10RT34-2/4.

used correctly, this problem [of having the EC and IR working correctly and independently] probably would not have occurred."¹⁴⁴

The Alcotest code also presents a rat's nest of excess, irrelevant, and purportedly unused code.¹⁴⁵ This isn't just bad housekeeping. These excessive bits and pieces of superfluous code are invitations for error and unnecessarily expose anyone tested on the Alcotest to undetectable error. As Workman said of the Middlesex County data, while the 1900+ AIRs in that universe may appear to be reliable, in actuality, none can be considered reliable. The notion that, compared to the Breathalyzer, "the Alcotest 7110 uses newer technology and is more transparent because it produces a printout"¹⁴⁶ is simply incorrect.

III.

Institutional Deficiencies Evidenced by Draeger's Culture of Concealment and the State Police Forensic Laboratory's Culture of Ignorance Undermines Confidence in the Present Alcotest Program and Any Determination of Alcotest Reliability

Complexity, excessive use of global variables, and the specific defects compromise the scientific reliability of Alcotest source code. So, too, is Draeger's failure to document its coding processes and its failure to use standards. This betrays the biggest problem of all -- the institutional problem. Draeger's corporate culture elevates false appearances above scientific reliability, so-called trade secrecy above objective

¹⁴⁴ 10RT133-9/14.

¹⁴⁵ See 9RT218-14/20.

verification, and profits above justice. As Judge King noted:

All through this matter, Draeger wanted to keep this thing secret and they said we'll give you eight hours in a tin can or someplace in Durango where you can look at it and not make notes. And now I see 200 hours, 300 hours by these experts who examined this code. So, that sounds a little fishy to me. Why are they this restrictive and secretive? Is it some kind of cabal of opposition to information being disseminated or perhaps a cultural norm? In Europe they do things differently than here? I don't know. But it makes me suspicious.¹⁴⁷

Adding to these suspicions is utter disregard of the generally accepted practice of logging errors and operational data. Systems traditionally log information so that a programmer can analyze the data, reconstruct what the software is doing, find faults, and debug the program.¹⁴⁸ Most embedded systems used by consumers today have some type of data logging to facilitate efficient repairs, preserving profitability for manufacturers, and maintaining standards.¹⁴⁹ For example, this is common practice with cars,¹⁵⁰ copiers,¹⁵¹ and laptop computers.¹⁵² Draeger showed no evidence of any meaningful error logging.¹⁵³

A culture oriented to scientific reliability encourages consumers to report problems to the manufacturer so the manufacturer can make a better product.¹⁵⁴ If the culture wants to find errors (even errors like those in the Gonzalez example

¹⁴⁶ SMR108, citing 57T23-24.

¹⁴⁷ 12RT39-10/20.

¹⁴⁸ 10RT15-24/16-9, 19-14/18.

¹⁴⁹ 10RT18-22/19-5.

¹⁵⁰ 10RT16-12/15.

¹⁵¹ 10RT18-17/21.

¹⁵² 10RT21-2/15.

¹⁵³ 10RT19-20/21-7.

above), it establishes a mechanism to do so.¹⁵⁵

Unfortunately, there is no quality assurance organization within Draeger responsible for measuring overall quality, implementing proper techniques, and adhering to standards -- no standards, no testing, no quality assurance.¹⁵⁶ Draeger's culture appears to be not one of improving overall reliability, but rather one of responding to bugs and scrambling to fix them.¹⁵⁷

While "sticking its head in the sand" to avoid finding errors, no one within the organization listens to and tries to assimilate problems.¹⁵⁸ Misrepresentations about software and hardware capabilities are endemic in the computer industry.¹⁵⁹ If Draeger finds software errors in one jurisdiction, it does not recall units in others¹⁶⁰ or give advice about the errors. While some manufacturers provide algorithms and source code to attorneys and defense experts,¹⁶¹ Draeger baselessly claims that all of its software is proprietary and resists disclosure.

While source code documentation is necessary, Draeger does not document its software.¹⁶² While Draeger's vice-president Hansueli Ryser claims to maintain ISO 9000 certification and supervise Shaffer about compliance,¹⁶³ Shaffer does not know what

¹⁵⁴ See, e.g., 10RT22-6/23-15.

¹⁵⁵ 10RT20-12/21, see 10RT24-17/24, see also 10RT23-10/12.

¹⁵⁶ 10RT34-22/35-20.

¹⁵⁷ 10RT91-12/16.

¹⁵⁸ See 10RT24-25/25-4.

¹⁵⁹ 30T36-37.

¹⁶⁰ 25T40-41.

¹⁶¹ See 5T90-20/91-6.

¹⁶² See 24T57-8/59-1.

¹⁶³ 30T30-20/23.

ISO 9000 or any other standard is.¹⁶⁴

Meanwhile, our chief forensic scientist embarked into a novel scientific field, but failed to consult anyone with the requisite expertise in computer science.¹⁶⁵ The State never asked Draeger or anyone else about software errors.¹⁶⁶ They not only failed to see any problems. They did not even look.

As a general rule, New Jersey does not log problems.¹⁶⁷ New Jersey has no protocol to determine whether its software functions properly.¹⁶⁸ Thus, reliability issues will be hidden, except in individual cases when errors are manifest on an alcohol influence report.¹⁶⁹ Such observable errors undermine confidence in the unobservable.¹⁷⁰ Examples of observed errors in the present matter include alcohol influence reports from East Brunswick, Milltown, South River, New Brunswick, Longport, and many other police departments.¹⁷¹ Without error logging like that done in Alabama and Massachusetts,¹⁷² and with no one within the organization to report problems to,¹⁷³ no reliability assessment either at the outset or on an on-going basis is possible.

Draeger can implement standards and possibly correct the

¹⁶⁴ 5RT38-23/39-23.

¹⁶⁵ See, generally, 10RT24-12/17.

¹⁶⁶ See 48T28-2/18.

¹⁶⁷ 41T45-6/8.

¹⁶⁸ See, e.g., 41T39-7/40-4, 41-12/42-21, 64-6/12.

¹⁶⁹ 9RT207-11/20, see 41T44-22/24.

¹⁷⁰ 9RT208-18/209-12, 10RT101-2/12.

¹⁷¹ See Da201-318.

¹⁷² 9RT211-24/213-2; 10RT27-19/28-2, 28-16/22.

¹⁷³ 10RT24-24/25-4.

Alcotest software problems,¹⁷⁴ but such implementation may fail if their culture of concealment persists. The State may find an appropriate breath testing instrument, but only if they seek an accurate and scientific program.

Despite these complementary cultures of concealment and ignorance, perhaps Draeger and the State can save the Alcotest -- but not with its present source code version. It is impossible to make the Alcotest using version 3.11 reliable. All readings must be excluded. To save the Alcotest -- to make it scientifically reliable -- to avoid the necessity of serial courtroom proceedings to determine whether the device is scientifically reliable -- Draeger, with direction from the State, must adopt recognized standards. They must make sure to take a scientific approach to source code development, error detection, and error correction -- just as they do with their medical devices. Standards will force Draeger to:

- Assure that, in initial coding, most common errors are avoided.
- Assume that all released code is still imperfect.
- Institutionalize a systematic search for imperfections.
- Require documentation at both implementation and for each correction.

In short, Alcotest source code must be rewritten from scratch and deployed correctly, scientifically, according to a recognized standard, and in a traceable provable documented way. Only then it may be considered scientifically reliable.

¹⁷⁴ 10RT32-25/33-4; see 10RT34-7/12, 37-1/16.

COMMENTS ON WITNESSES

I.

Source Code Witnesses Geller, Shaffer, and Wisniewski

Generally, a source code review is a methodical way to examine code for problems; it is usually done by a third party in a more formal way than an informal desk check.¹⁷⁵ The code reviews in this case did not involve any exercising of the software with the hardware.¹⁷⁶ Geller, Shaffer, and Wisniewski had the advantage of having actually reviewed the source code itself, albeit from three distinctly different perspectives.

SysTest was able to compile the Alcotest code early with the help of Draeger's Shaffer.¹⁷⁷ Geller, who wrote less than half of the report¹⁷⁸ on which he collaborated with SysTest's Dan McNamee and Geoffrey Pollich,¹⁷⁹ used certain automated tools for his examination, including something called "Module Finder EX," a "proprietary" program created by SysTest which apparently has problems of its own given the way it has been developed in secret and not according to any recognizable standard.¹⁸⁰ When asked, "Were any development standards adhered to when Module Finder was built?" Geller lamented, "Sadly, not."¹⁸¹ It is ironic that Geller examined secret Alcotest code with another secret program for which SysTest could only claim reliability by asserting its

¹⁷⁵ 9RT209-24/210-6.

¹⁷⁶ 9RT219-13/220-10.

¹⁷⁷ See 1RT94-4/95-13.

¹⁷⁸ 1RT37-9/12.

¹⁷⁹ 1RT36-12/18.

¹⁸⁰ See 10RT41-8/22.

trade secrecy gave SysTest a competitive edge. Geller regrets Module Finder's lack of standardization because of how hard it has become to maintain with each revision.

Like Wisniewski, Geller used "Understand," an appropriate tool for determining a program's complexity and the number of global variables.¹⁸² But Geller's use of "Fortify SCA" was inappropriate, since that tool is intended to detect and fix security vulnerabilities, not coding errors.¹⁸³ By using "Fortify SCA," SysTest postulates a hacker, a red herring, a straw dog. Would anyone hack into the Alcotest the way one might hack into a voting machine? Overall, either SysTest was either not looking very hard for defects or did not know how to find them.¹⁸⁴

Geller, a senior software engineer at SysTest¹⁸⁵ educated at Metropolitan State College with a Bachelor of Science degree in computer science in 1992¹⁸⁶ and three additional courses thereafter,¹⁸⁷ had no experience with either electronic metrological equipment or software doing analog to digital conversion.¹⁸⁸ He managed voting machine source code review.¹⁸⁹

John Wisniewski, however, has more than 30 years experience with software, hardware, and embedded systems,¹⁹⁰ along with well-

¹⁸¹ 2RT155-8/10.

¹⁸² 10RT40-14/41-5.

¹⁸³ 10RT40-1/6.

¹⁸⁴ 10RT65-14/21.

¹⁸⁵ 1RT18-21/24, see Da124-27 (SysTest pp. 49-52).

¹⁸⁶ 1RT29-7/8.

¹⁸⁷ 1RT43-9/19.

¹⁸⁸ 1RT44-6/45-1.

¹⁸⁹ 1RT28-2/3; see 1RT19-12/15, 2RT170-5/13.

¹⁹⁰ 6RT183-18/184-1, see Da66-74 (BaseOne pp. 47-55).

rounded comprehensive experience in all phases of the software development life cycle, including writing, testing, analyzing, reviewing, and documenting source code.¹⁹¹ Specifically, he has:

- a Bachelor of Arts degree in computer science from State University of New York at Potsdam in 1976.¹⁹²
- taught undergraduate classes in Assembly language and systems analysis.¹⁹³
- written many programs in Assembly and C languages,¹⁹⁴ among others.¹⁹⁵
- written¹⁹⁶ and tested code¹⁹⁷ for various applications.
- written spacecraft tracking software for the National Aeronautic and Space Administration¹⁹⁸ and Jet Propulsion Laboratories.¹⁹⁹
- written, analyzed, and troubleshot code for embedded systems like the B-1 Bomber²⁰⁰ Voyager spacecraft,²⁰¹ satellite and spacecraft telemetry (including analog to digital conversion),²⁰² among other software and hardware projects.²⁰³
- integrated software and hardware, including projects involving the B-1 Bomber,²⁰⁴ voice recognition systems,²⁰⁵ and washing machines.²⁰⁶

¹⁹¹ 6RT177-7/15.

¹⁹² 6RT197-21/198-8.

¹⁹³ 6RT199-3/10.

¹⁹⁴ 6RT213-24/214-3, 214-13/16, 217-6/11, 218-13/21, 222-16/224-3; 7RT16-23/17-1.

¹⁹⁵ 6RT178-15/21, 206-16/19, 208-14/17; 7RT6-4/12, 7-22/8-7, 13-20/14-6, 17-10/21.

¹⁹⁶ 6RT208-18/209-14, 213-24/214-6, 214-13/20, 216-22/217-11, 217-25/218-21, 222-6/223-8.

¹⁹⁷ 6RT209-15/20, 214-7/9.

¹⁹⁸ 6RT203-18/24.

¹⁹⁹ 6RT204-11/15.

²⁰⁰ 6RT200-1/201-25.

²⁰¹ 6RT204-16/205-1.

²⁰² 6RT207-8/209-14.

²⁰³ 6RT179-15/180-25, 212-5/13.

²⁰⁴ 6RT178-22/179-11.

²⁰⁵ 6RT219-9/220-7.

²⁰⁶ 6RT177-18/178-14; 7RT6-4/12, 18-23/19-2.

□ worked with various software tools, including Lint.²⁰⁷

□ developed software in conformance to standards.²⁰⁸

Wisniewski conducted his review using different automated tools than SysTest -- notably, a program called *lint*, a generally available open-source tool which prolifically finds defects.²⁰⁹ Indeed, Lint's function is to find defects and problems in the source code.²¹⁰ Coupled with his demonstrably superior practical experience in embedded system programming for applications from aerospace to washing machines, Wisniewski homed in on very significant specific problems in Alcotest source code.²¹¹

Shaffer, Draeger's programmer of the application now before us,²¹² has no familiarity with ISO 9000, Institute of Electronic and Electrical Engineers ["IEEE"], or other standards for software.²¹³ He uses no standard methodology himself, other than walling off key routines in his head.²¹⁴ He neglects headers within the code that would ordinarily provide signposts for others to follow.²¹⁵ He has introduced unintentional error like the buffer overflow. His experience with embedded systems programming prior to his employment with Draeger was in the model railroading field working with train whistles.²¹⁶ With Shaffer,

²⁰⁷ 6RT185-3/194-14, see 6RT187-6/10 for Lint reference.

²⁰⁸ 6RT194-15/195-23, 213-6/23, 217-17/21; 7RT16-3/7.

²⁰⁹ 9RT220-13/221-7, 222-1/5, 222-16/23; 10RT38-15/39-15, 65-9/13.

²¹⁰ 9RT223-22/224-5.

²¹¹ 10RT39-16/20.

²¹² 5RT5-21/6-2.

²¹³ 6RT38-23/39-23.

²¹⁴ , see 24T26-6/28-1.

²¹⁵ 5RT119-3/120-6, see Da34 (BaseOne p.15).

²¹⁶ 5RT169-7/170-5.

"all I have to do is wonder how much interest he has. Job at stake? This enterprise at stake?"²¹⁷

Neither Geller,²¹⁸ Wisniewski,²¹⁹ nor Shaffer had testified in court before. **Geller** was somewhat evasive when answering questions, often pausing for long periods before responding, often disclaiming a challenge citing the limited scope of his assigned task.²²⁰ Geller lacked command of the powers of two.²²¹ **Shaffer**, even though constrained by his status as a Draeger employee, disclosed the fraud within Draeger's code that neither SysTest nor BaseOne detected -- the algorithm that forced EC and IR results to agree when the EC value drifts too far from the IR value.²²² His confession of engaging in questionable practices like disregarding header information within the code seems borne more of ignorance than intent to deceive.²²³ Like Geller, he had difficulty with powers of two²²⁴ and no engineering experience.²²⁵

Wisniewski was a most objective and credible witness. As Judge King found, Wisniewski was, indeed, "very negative and deconstructive,"²²⁶ given the nature of his task and what he actually found. He began his task under the mistaken impression

²¹⁷ 12RT40-5/9.

²¹⁸ 1RT34-25/35-5.

²¹⁹ 6RT186-14/17.

²²⁰ See, e.g.: 1RT183-8/183-22; 2RT148-19, 149-12, 150-8, 171-20.

²²¹ 1RT79-18/81-13; see 10RT60-10/61-2, 63-6/64-15; see DR-18.

²²² 5RT224-11/14 (emphasis added); see also 5RT226-19/24, 227-17/21, 230-6/13.

²²³ 5RT119-3/120-6.

²²⁴ 6RT32-2/6.

²²⁵ 5RT6-15/20.

²²⁶ 2SMR48.

that he worked for the State,²²⁷ and is the epitome of the independent software reviewer this Court probably had in mind on remand. For the most part, he was able to document every error he discovered and reported. His discomfort with the use of the term "standards" seemed more semantic than substantive, preferring the term "developmental methodologies" -- a term more consistent with the way he himself reviewed and developed reliable code throughout his career.²²⁸

II. Expert Witnesses Seidman, Dee, and Workman

The remaining experts -- Stephen Seidman last year and Norman Dee and Thomas Workman this year -- did not have the benefit of actually seeing source code, except for the few snippets offered in evidence. But patent attorney Workman -- with more than 30 years experience working in high technology for various corporations in many capacities, including management, engineering, research, quality assurance, and software development -- is probably most representative of the relevant scientific community for this case. Specifically, he has

- written, developed, and reviewed source code standards as HP's representative on the IEEE Computer Standards Board.²²⁹
- used and applied standards in the course of source code review, vendor selection, and systems verification for such massive technology-based companies as Hewlett-Packard, Digital Equipment, Xerox, and Texas Instruments, among

²²⁷ 7RT96-1/4.

²²⁸ See 6RT194-17/21, 9RT173-17/21.

²²⁹ 9RT170-7/172-5.

others.²³⁰

- peer reviewed the work of Thomas McCabe, recognized by both BaseOne and SysTest for developing ways to measure cyclomatic complexity.²³¹
- performed ISO 9000 certification for Digital, a major corporation with operations here and in Scotland.²³²
- worked with embedded systems dependent on sensors, much as the Alcotest is dependent on sensors.²³³
- formulated a major scientific principle in the field, "Workman's Law," which is named after him!²³⁴
- testified not only in courts but also before Congress as an expert on computer software issues.²³⁵
- been unrebutted by anyone else who has testified in this hearing.

Stephen Seidman, Ph.D., an academic, former Dean of the College of Computer Science at N.J. Institute of Technology, and current Dean of the College of Natural Sciences and Mathematics at the University of Central Arkansas,²³⁶ was qualified as an expert in software engineering.²³⁷ He testified last year about source code with errors and the need for coding standards.²³⁸

Judge King stated:

- "If there were errors in the software, Seidman would want to know about them as they would raise questions in his mind about the instrument's accuracy...."²³⁹

²³⁰ 9RT153-2/154-21, 163-5/165-12, 168-18/169-10, 173-5/16, 203-1/12.

²³¹ 9RT172-15/20.

²³² 9RT168-22/170-6, see 9RT153-7/23.

²³³ 9RT154-22/158-22, 160-22/161-2, 161-14/162-25.

²³⁴ 9RT174-13/175-14.

²³⁵ 9RT180-22/181-8, 184-14/185-14; see 9RT204-4/19.

²³⁶ 16T21-1/14.

²³⁷ 16T69-12/14.

²³⁸ 18T12-17/20-25; see D-47 Da154 et seq.

²³⁹ SMR108, citing 18T67.

- "When shown several AIRs with apparent errors, Seidman said that he would want to understand the reasons for them before he gave an opinion on the accuracy of New Jersey's breath-testing program...."²⁴⁰

Norman Dee, on the other hand, still holds the opinion that source code review is unnecessary and minimizes the importance of reviews done for the present hearings -- a view clearly at odds with the instructions handed down from this Court. He has no experience in legal metrology or analog systems.²⁴¹ His coding experience is extremely limited, sporadic, and unrelated to analyzing measurements to produce results.²⁴² He has almost no experience with embedded systems like the Alcotest's,²⁴³ and has never written code for such systems.²⁴⁴

III. Special Master's Credibility Determinations

Judge King, a self-professed Luddite²⁴⁵ proud of not owning a cell phone or using e-mail,²⁴⁶ did a remarkable job during the first hearing last year seeking to understand the Alcotest technology. At one point near the end of this remand, he appeared to understand. "It's like I got off the subway in Times Square and I got a little three card monte going on."²⁴⁷ Unfortunately, he either failed to grasp or chose to ignore the

²⁴⁰ SMR108, citing 18T77, D-59, D-60, D-61, D-62, D-63, D-64).

²⁴¹ 30T41-25/42-6.

²⁴² 30T42-7/23, 43-13/17.

²⁴³ 30T47-13/18, see 30T46-9/11.

²⁴⁴ 30T47-15/18.

²⁴⁵ 1RT25-17.

²⁴⁶ 68T48-18/21.

significance of examining source code and bought the State's argument that black box testing was sufficient to prove reliability. He either never appreciated or declined to acknowledge the significance of source code hidden by Draeger.

With all due respect to this distinguished and accomplished jurist, Judge King clearly was confused,²⁴⁸ bored,²⁴⁹ and disinterested in the complexity and intricacies of source code examination and the highly technical expert testimony, calling it "electrical mysticism."²⁵⁰ In considering Wisniewski's qualifications, he confessed, "I don't know what it means to be qualified."²⁵¹ He sought to severely limit defense cross-examination, but did relent to defense repeated demands for fairness and justice and the urging of your *amicus* New Jersey State Bar Association for fairness and justice.²⁵² The defense experts' credentials and the lack of the proponents was amply demonstrated in the record before this Court. His findings of credibility and reliability are inconsistent with the record and suggest an unwarranted commitment to his previous, but now discredited, acceptance of black box testing. For example:

His swipe at John Wisniewski, expressing "doubt that he was as experienced as portrayed,"²⁵³ was offensive and gratuitous,

²⁴⁷ 12RT40-20/21.

²⁴⁸ 3RT164-13/165-13; 4RT112-20/25, 172-1/3; 6RT107-10/11; 7RT127-5/12.

²⁴⁹ See, e.g., 7RT14-22/24 during Wisniewski's *voir dire*.

²⁵⁰ 1RT37-17/19.

²⁵¹ 7RT35-22/24.

²⁵² 2RT204-17/211-23; 3RT86-8/87-2, 100-18/24, 103-19/21.

²⁵³ 2SMR48.

especially given the fact that no challenge whatsoever to his credentials was ever raised at any time in this matter. Wisniewski is a "rocket scientist" with familiarity with all aspects of embedded computer hardware and software systems. To cast Bruce Geller as "technically impressive"²⁵⁴ especially in light of the comparison of his meager credentials against Wisniewski's extraordinary experience begs credulity.

The same can be said of Judge King giving "considerable weight" to the "impressive witness" Norman Dee, yet dismissing Thomas Workman's testimony as unpersuasive²⁵⁵ and relegating him to the limbo of "excluded evidence" under R. 1:7-3 -- a position he stated before Workman even began his testimony.²⁵⁶ Of course, rather than outright exclusion, Judge King assigned it his own weight within the confines of his limited understanding of the subject matter to which Workman testified.²⁵⁷

Overall, Judge King's credibility findings and his finding of software reliability is unfortunately grounded in lack of a grasp of this technology and not a fair assessment of the testimony.

²⁵⁴ 2SMR28.

²⁵⁵ 2SMR61.

²⁵⁶ 9RT5-1/19.

²⁵⁷ 2SMR61-62.

APPLICABLE LEGAL PRINCIPLES

I.

Draeger's Failure to Adhere to Any Recognizable Standard Precludes a Finding that Its Source Code for the Alcotest Has Gained General Acceptance in the Scientific Community

Overall Alcotest reliability is a function of three sub-parts: its hardware, its software, and its testing processes.²⁵⁸ In the present remand, this Court focuses on software and its testing.²⁵⁹ The legal standard we must apply to version 3.11 has been stated in our cases thus:

"[T]he thing from which the deduction is made must be sufficiently established to have gained *general acceptance in the particular field in which it belongs.*"²⁶⁰

"Thus, the test in criminal cases remains whether the scientific community generally accepts the evidence."²⁶¹

In applying these legal requirements, we (a) define the particular field in which source code analysis resides, (b) consider who is the scientific community encompassing this particular field, and (c) consider whether the source code in question here would be generally accepted within the relevant scientific community.

²⁵⁸ 10RT5-18/21, 7-3/14.

²⁵⁹ 10RT7-15/21, 8-12/20, 9-1/4.

²⁶⁰ *State v. Harvey*, 151 N.J. 117, 169 (1997), quoting *Frye v. U.S.*, 293 F. 1013, 1013-14 (D.C.Cir. 1923) (emphasis added).

²⁶¹ *State v. Harvey*, *supra*, 151 N.J. at 170.

The Particular Scientific Field

The particular fields with which we are concerned in this case are those of computer science, electrical engineering, and software programming -- fields separate and distinct from that of forensic science with which we were so concerned last year. We know this because:

- NHTSA [National Highway Traffic Safety Administration] has no programming standards. NHTSA's Edward Conde relied on incomplete computer generated data -- the alcohol influence reports -- and flawed data, accepting one test that the Alcotest itself rejected.²⁶²

- All of the State's witnesses from last year that purported to be members of the forensic science field -- Edward Conde,²⁶³ Samuel Chappell,²⁶⁴ Barry Logan,²⁶⁵ Rod Gullberg,²⁶⁶ J. Robert Zettl,²⁶⁷ Patrick Harding,²⁶⁸ Thomas Brettell²⁶⁹ -- not only professed no knowledge of computer science but affirmatively disavowed such knowledge.

No one from that community of forensic scientists put it more poetically than Robert Zettl, who declared that, for all he knew, "two magic rocks from Ireland banging together will give you a .10...."²⁷⁰ Rod Gullberg, recognizing his limitations as a statistician and forensic scientist, specifically recommended that source code be independently verified.²⁷¹

²⁶² See 2T102-6/105-18, 107-25/109-22; 3T8-7/24, 11-21/24, 12-9, 13-4/14-21; 10RT104-19/23, 106-1/5, 107-18/108-10, 112-10/21, 119-3/17.

²⁶³ See 2T8-12, 54-1/5, 113-10/12.

²⁶⁴ See 3T160-7/11, 162-15/20, 164-5/10.

²⁶⁵ See 5T21-11/15, 82-13/17.

²⁶⁶ See 12T82-1/7, 13T52-20/24.

²⁶⁷ See 13T81-12/21; 14T64-24/65-1; 15T8-8/12, 18-8.

²⁶⁸ See 26T88-8/89-7.

²⁶⁹ See 37T47-5, 168-24/169-1; 39T8-18/25; 41T58-5/15, 135-12/21; 44T26-1/4.

²⁷⁰ 15T7-21/23.

²⁷¹ 13T52-13/24, 13T53-24/54-4; D-16.

The Relevant Scientific Community

Thus, we leave the field of endeavor in which we examined the Alcotest last year -- that of the forensic science community -- and consider it in these new and closely aligned fields of computer science, electrical engineering, and software programming that encompass source code review. This community includes software engineers and software management worldwide.²⁷² The relevant witnesses presented by the State last year were Stephen Seidman, Norman Dee, and Hansuli Ryser. This year, the State called SysTest's Bruce Geller and Dee. Judge King called Draeger's Brian Shaffer. The defense called expert examiner John Wisniewski of BaseOne and standards expert Thomas Workman.

General Acceptance Defined

Having defined the scientific community and discussed how they are represented in this case, we can ask: How does a court determine what scientific reliability is, and what are the hallmarks of general acceptance in this community? To answer these questions, let us examine what science and the scientific method is. Scientific method rests on a foundation of testing, standards, and peer review and publication. The U.S. Supreme Court described scientific method this way:

- **Testing:** "Scientific methodology today is based on generating hypotheses and testing them to see if they can be falsified; indeed, this methodology is what distinguishes science from other fields of human inquiry."²⁷³

²⁷² See 9RT188-9/16, 190-14/191-16.

²⁷³ *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 509 U.S. 579,

□ **Standards:** "[T]he court ordinarily should consider the known or potential rate of error...and the existence and maintenance of standards controlling the technique's operation...."²⁷⁴

□ **Peer Review and Publication.** "Another pertinent consideration is whether the theory or technique has been subjected to peer review and publication."²⁷⁵ This is because "submission to the scrutiny of the scientific community is a component of 'good science,' in part because it increases the likelihood that substantive flaws in methodology will be detected."²⁷⁶ **** The fact of publication (or lack thereof) in a peer reviewed journal thus will be a relevant, though not dispositive, consideration in assessing the scientific validity of a particular technique or methodology on which an opinion is premised."²⁷⁷

General acceptance is demonstrated by a super-majority of scientists in the software community -- on the order of 80 to 90 percent.²⁷⁸ It is codified in industry standards.²⁷⁹ It is vetted until it is no longer controversial.²⁸⁰ Its methods must be objective, repeatable, quantifiable, and standardized.²⁸¹ Determinations of reliability and general acceptance are based on measurements and observations.²⁸²

The Quality and Burden of Proof

Our cases hold that "a belief that the device is broadly accurate is not sufficient."²⁸³ "Proving general acceptance

593, 113 S.Ct. 2786, 125 L.Ed.2d 469 (1993); see 10RT19-7/13.

²⁷⁴ *Id.*, 509 U.S. at 594 (citations omitted).

²⁷⁵ *Id.*, 509 U.S. at 593.

²⁷⁶ *Id.*

²⁷⁷ *Id.*, 509 U.S. at 594.

²⁷⁸ 9RT188-19/23.

²⁷⁹ 9RT191-8/16.

²⁸⁰ 9RT191-20/192-7.

²⁸¹ 9RT192-14/193-1.

²⁸² 9RT194-14/23.

²⁸³ *In re LTI Marksman 20-20 Laser Speed Detection System*, 314 N.J.Super. 211, 230 (Law Div. 1996) ["Laser I"].

'entails the strict application of the scientific method, which requires an extraordinarily high level of proof based on *prolonged, controlled, consistent, and validated* experience.'²⁸⁴

All four pillars -- *prolonged, controlled, consistent, and validated* experience -- must stand to support a finding of scientific reliability by that highest of the civil burdens of proof, clear and convincing evidence -- a standard of proof defined as evidence that

"produce[s] in the mind of the trier of fact a firm belief or conviction as to the truth of the allegations sought to be established," evidence "so clear, direct and weighty and convincing as to enable [the fact finder] to come to a clear conviction, without hesitancy, of the precise facts in issue."²⁸⁵

"[T]he responsibility for establishing all conditions as to the admissibility of [Alcotest] results is properly allocated to the State"²⁸⁶ and, by extension, Draeger as an intervenor with a blatant mercenary interest. As we have seen, they failed to meet that burden. While Defendants have no burden whatsoever, they have not only called the code and Alcotest into question but also affirmatively demonstrated that it is unreliable:²⁸⁷

Q. If you were to characterize this software on that scale of 1 to 10, where you keep on working and try to get a 10, where would you put this, having reviewed all the code?

²⁸⁴ *State v. Harvey, supra*, 151 N.J. at 171, quoting *Rubanic v. Witco Chemical Corp.*, 125 N.J. 421, 436 (1991).

²⁸⁵ *In re Seaman*, 133 N.J. 67, 74 (1993) (citations omitted).

²⁸⁶ *Romano v. Kimmelman, supra*, 96 N.J. at 91.

²⁸⁷ See 8RT199-7/13; 9RT208-11/209-12; 10RT146-5/11, 147-7/21.

A. I hadn't thought about that. There's so much missing in other documentation, I would have to say it's about a two or a three.²⁸⁸

Indeed, Defendants submit that the appropriate burden for admissibility should be beyond a reasonable doubt, given the nearly presumptive nature of *per se* breath evidence.²⁸⁹ After all, when *Romano v. Kimmelman* was decided, this Court considered breath test evidence for municipal court cases decided under a statutory scheme that made breath test results merely presumptive and not conclusive evidence of guilt.²⁹⁰

In the present case, Defendants have raised many factual issues that we have characterized as "Show Stoppers," since any one of them alone should sufficiently call into question Alcotest reliability so as to make its results inadmissible. Indeed, given these facts, among others -- (a) the limited time perimeters within which source code review occurred, (b) two different examiners using different review tools and methods found discreet problems which the other did not, (c) the lie, discovered only on cross examination, that two allegedly independent technologies verify each other, (d) the morass of unexamined code still hidden by a culture of concealment and the absence of any systematic standardized method for discovering and correcting errors. What Judge King calls "speculation" is, in fact, unreliability. It was never Defendants' burden to prove

²⁸⁸ 8RT129-25/130-6.

²⁸⁹ *Romano v. Kimmelman*, *supra*, 96 N.J. at 90.

²⁹⁰ See *N.J.S.* 39:4-50 and its history.

that the Alcotest was unreliable. Rather, it was the State's and Draeger's to prove it reliable. They failed.

Methods of Proof

A proponent of newly-devised scientific technology can prove its general acceptance in three ways: (1) by expert testimony as to general acceptance, among those in the profession, of the premises on which the proffered expert witness based his or her analysis; (2) by authoritative scientific and legal writings indicating that the scientific community accepts the premises underlying the proffered testimony; and (3) by judicial opinions that indicate the expert's premises have gained general acceptance.²⁹¹ Reviewing these three methods of proof in the present case in reverse order:

This case is the first of its kind. While adversaries in other jurisdictions fight over source code discovery, and in others, production was ordered, nowhere else has a review of code taken place as it has here. Thus, no judicial opinions about Draeger source code reliability exist. Nor are there any authoritative scientific or legal writings about Draeger source code. There is ample authority in the scientific community about what makes source code and computer programs reliable.²⁹²

The great weight of credible expert testimony in this case clearly demonstrates what it takes for source code to be considered scientifically reliable. Judge King's credibility

²⁹¹ *State v. Harvey, supra*, 151 N.J. at 170.

²⁹² See Thomas Workman's bibliography at Da140-41. See also,

findings notwithstanding, the witnesses most qualified to assess Alcotest version 3.11 found it unreliable.²⁹³ The objective record clearly demonstrates that John Wisniewski is more qualified and more credible than Bruce Geller, that Thomas Workman is more qualified and more credible than Norman Dee.

The Application of Standards

For the computer science community, the hallmarks of scientific reliability are embodied in standards -- or more descriptively -- standardized developmental methodologies.²⁹⁴ Tom Workman, from his education and career experience,²⁹⁵ testified to how standards were developed,²⁹⁶ how they are codified,²⁹⁷ and what makes them scientific.²⁹⁸ John Wisniewski, in the context of his experience and the present code review, discussed such standardized developmental methodologies as yielding more reliable code,²⁹⁹ saying: "You can't just write code and then review it yourself and test it yourself. There has to be an independent review of it by someone else so that you're not tainted in your judgment."³⁰⁰

Standards take into account the first requirement of science by requiring the statement of hypotheses through

e.g., FDA standards bibliography at Da193-200.

²⁹³ 9RT174-1/3, 187-5/19.

²⁹⁴ 6RT194-17/21, see 9RT173-17/21.

²⁹⁵ 9RT150-21/152-10, 152-24/158-22, 159-17/161-2, 161-14/165-17, 168-15/173-16, 184-14/185-14.

²⁹⁶ 9RT171-6/172-5.

²⁹⁷ 9RT191-8/16.

²⁹⁸ 9RT191-20/195-19.

²⁹⁹ 6RT196-16/23.

³⁰⁰ 6RT195-25/196-3.

documentation -- with a requirements document at the outset of coding³⁰¹ and further documentation for error detection and error correction.³⁰² Standards were developed in a collaborative fashion, subjected to rigorous peer review, and requiring a high degree of consensus on the order of 80 percent.³⁰³

Standards were developed by industry and IEEE. Governments adopt them as part of product specifications when a high degree of reliability is required. Standards are used to keep rockets from blowing up and satellites from crashing, to keep hearts beating³⁰⁴ and maintain geosynchronous satellite positioning³⁰⁵ for TV programs. Standards are important because code, like human beings, can never be perfect.³⁰⁶ But, through the application of standards, code can be scientifically reliable.³⁰⁷

Standards have been in use for a long time. While there may have been some debate whether coding standards were necessary decades ago, there is no true debate today. If an application is sufficiently important, it must be developed and maintained according to some standard.³⁰⁸ There is nothing new or novel about this concept. The use of standards is a prerequisite to a determination that source code is scientifically reliable.

The application with which we are concerned here is clearly

³⁰¹ 10RT37-21/22, see 10RT38-5/10, see also Da151.

³⁰² 10RT15-24/16-15, 18-17/19-18, 26-5/9.

³⁰³ 9RT171-6/172-5, 188-19/23.

³⁰⁴ 9RT203-16/21.

³⁰⁵ See 6RT209-24/212-13.

³⁰⁶ 9RT201-10/11.

³⁰⁷ 9RT203-16/21.

³⁰⁸ 18T12-17/20-25; see D-47 at Da154 et seq.

important. Evidence developed with this technology will send people to jail. The importance of the application here is more on par with airplane landing gear, pace maker functioning, and satellite navigation than with model train whistles or even voting machines.

II. Presently Unknowable Source Code Deprives Any Challenger of a Reported Breath Test Result Any Meaningful Right of Confrontation

"In all criminal prosecutions, the accused shall enjoy the right to be confronted with the witnesses against him."³⁰⁹ This right to confrontation is fundamental and essential to a fair trial in a criminal prosecution.³¹⁰ "[A] major reason underlying the constitutional confrontation rule is to give a defendant charged with crime an opportunity to cross-examine the witnesses against him."³¹¹ As a result, "it cannot seriously be doubted at this late date that the right of cross-examination is included in the right of an accused in a criminal case to confront the witnesses against him."³¹² In fact:

There are few subjects, perhaps, upon which this Court and other courts have been more nearly unanimous than in their expressions of belief that the right of confrontation and cross-examination is an essential and fundamental requirement for the kind of fair trial which is this country's constitutional goal. Indeed, we have expressly declared that to deprive an accused

³⁰⁹ *U.S.Const., Amend.VI.*

³¹⁰ *Pointer v. Texas*, 380 U.S. 400, 403-04, 85 S.Ct. 1065, 13 L.Ed.2d 923 (1965).

³¹¹ *Id.* at 406-07.

³¹² *Id.* at 404.

of the right to cross-examine the witnesses against him is a denial of the Fourteenth Amendment's guarantee of due process of law.³¹³

Because of *Crawford v. Washington*,³¹⁴ New Jersey courts have been establishing a body of case law on Confrontation Clause issues.³¹⁵

³¹³ *Id.* at 405.

³¹⁴ 541 U.S. 36, 124 S.Ct. 1354, 158 L.Ed.2d 177 (2004).

³¹⁵ *State v. Nyhammer*, 396 N.J.Super. 72 (App.Div. 2007) (officer's testimony about child victim's out-of-court statements re alleged sexual assault by defendant, with admission of victim's videotaped statement, violated defendant's right of confrontation in trial for sexual assault and endangering welfare of child); *State v. Byrd*, 393 N.J.Super. 218 (App.Div. 2007) (trial court's in camera interview with witness violated defendants' right of confrontation, and admission of witness' inculpatory statement to police re events surrounding robbery and murder after witness refused to testify violated defendants' right of confrontation); *State v. Dorman*, 393 N.J.Super. 28 (App.Div.), cert.gr. in part, 192 N.J. 475 (2007) (trial court's admission of breath-test machine operability certificates under business records exception to hearsay rule did not violate right of confrontation); *State v. Burr*, 392 N.J.Super. 538 (App.Div. 2007) (no confrontation violation found where defendant was able to cross-examine child victim through counsel); *State v. Kent*, 391 N.J.Super. 352 (App.Div. 2007) (State Police laboratory report and related worksheets were testimonial under *Crawford*, and as were blood test certificate prepared by hospital employee who extracted blood from defendant at police officer's request); *State v. Renshaw*, 390 N.J.Super. 456 (App.Div. 2007) (admission of certification for bodily specimen taken in medically acceptable manner absent defendant's opportunity to cross-examine nurse who prepared certification violated defendant's confrontation rights); *State v. Buda*, 389 N.J.Super. 241 (App.Div. 2006), cert.gr. 191 N.J. 317 (2007) (statements of non-testifying child to DYFS worker were 'testimonial,' such that admission violated Confrontation Clause); *State v. Berezansky*, 386 N.J.Super. 84 (App.Div. 2006), cert.gr. 191 N.J. 317 (2007) (trial court's admission of lab certificate reporting defendant's blood alcohol concentration without testimony of its preparer violated defendant's constitutional right of confrontation); *State ex rel. J.A.*, 385 N.J.Super. 544 (App.Div. 2006), cert.gr. 191 N.J. 317 (2007) (admission of eyewitness' statements to police as witness perceived robbery came within either present sense impression or excited utterance exceptions to hearsay rule and did not violate juvenile's

This Court recently recognized the enormity of *Crawford* in *State v. Branch*,³¹⁶ when it reversed a conviction because a detective testified that he developed Branch as a suspect "based on the information received" and included Branch's picture in a photographic array shown to witnesses. This "information" constituted inadmissible hearsay, and the admission of testimony about this information violated defendant's confrontation rights in a burglary and robbery trial. The Court ultimately decided the case on state evidentiary grounds, but warned:

Although we decide this case based on our interpretation of an evidentiary rule, our analysis is informed by the principles undergirding the Confrontation Clause jurisprudence of our federal and state constitutions. In that regard, we must take notice of the potential impact that the recent watershed decision in *Crawford, supra*, will have on the introduction of "testimonial" hearsay through the excited utterance exception and other hearsay exceptions.³¹⁷

In *Branch*, the Court did not further assess what testimonial hearsay was, stating, "[W]e do not have to decide whether Detective Calvin's questioning of Juliana was 'police interrogation' or whether her statement was 'testimonial' in the manner understood in *Crawford*...because we can resolve this case on state evidentiary grounds."³¹⁸ However, the court noted, "*Crawford*...is a reminder that even firmly established exceptions

Sixth Amendment right of confrontation); *State v. Sweet*, 191 N.J. 318 (2007) (certification granted re admission of certificates re the contents of Breathalyzer ampoules).

³¹⁶ 182 N.J. 338 (2005).

³¹⁷ *State v. Branch, id.*, 182 N.J. at 368.

³¹⁸ *Id.* at 370.

to the hearsay rule must bow to the right of confrontation."³¹⁹
"Courts must be mindful, as well, of the requirements placed by *Crawford*...on the admission of testimonial evidence, whether in the context of the excited utterance exception or any other exception to the hearsay rule."³²⁰

In the present matter, this Court is confronted with an entirely new application of *Crawford*: confrontation of a machine. This Court recognized, *inter alia*, the significance of the issue in its remand of this case, ordering Draeger to produce the source code for testing and analysis.

From the examination of that code, Defendants determined that the code was so complex and badly organized as to make meaningful examination impossible. Neither BaseOne nor SysTest could fully analyze the code and its exponential number of analytical paths.

EC results are set, at least in part, as a function of IR results calculated via operation of an algorithm which no one can directly observe. This deprives Defendants of any opportunity to challenge, through confrontation, results generated or fabricated by the Alcotest.

With the Breathalyzer, despite its human manipulation and technological limitations, a defendant could still cross examine the machine's operator about the testing process. With the Alcotest, such questions are essentially limited to, "Did you

³¹⁹ *Id.* at 369-70.

³²⁰ *Id.* at 370-71.

press the orange button; did you enter the information requested by the machine; did the machine print a result?" If it produces a result above the *per se* limit, even with the safeguards suggested by Judge King in his initial report, there is no assurance that the machine reports accurate information. The true process of how various measurements are received by the hardware and interpreted by the software will remain always concealed. Nonetheless, even if Judge King's recommendations are followed, municipal courts will accept the Alcotest's final result printed on the alcohol influence report as if conclusive, depriving a defendant of any ability to confront and challenge the process used to achieve the result.

Although the aim of the proceedings before Judge King was to analyze the machine and its processes so that there would be no need for individual challenges in each and every case, nonetheless, there can be no credible assessment that the machine produces scientifically acceptable results based on the record before this Court. It is prettier than the Breathalyzer, apparently more modern in its appearance. But this pretty package conceals a presently unknowable process which no one can confront through cross examination.

III.
**Draeger Source Code, by Its Overly Complex Nature,
Conceals Material Exculpatory Information Which No
Defendant Will Ever Discover and Which the State Can
Never Reveal**

"One of the most basic elements of fairness in a criminal trial is...that the State in its zeal to convict a defendant not suppress evidence that might exonerate him."³²¹ "[S]uppression by the prosecution of evidence favorable to an accused upon request violates due process where the evidence is material either to guilt or to punishment, irrespective of the good faith or bad faith of the prosecution."³²² After all, the prosecutor

is the representative not of an ordinary party to a controversy, but of a sovereignty whose obligation to govern impartially is as compelling as its obligation to govern at all; and whose interest, therefore, in a criminal prosecution is not that it shall win a case, but that justice shall be done. As such, he is in a peculiar and very definite sense the servant of the law, the twofold aim of which is that guilt shall not escape or innocence suffer. He may prosecute with earnestness and vigor -- indeed, he should do so. But, while he may strike hard blows, he is not at liberty to strike foul ones. It is as much his duty to refrain from improper methods calculated to produce a wrongful conviction as it is to use every legitimate means to bring about a just one.³²³

In the context of private prosecutions, this Court noted that "dual responsibilities to the complaining witness and to the State breed numerous problems. Representation of the complainant in a related civil action could invest the prosecutor with a

³²¹ *U.S. v. Agurs*, 427 U.S. 97, 116, 96 S.Ct. 2392, 49 L.Ed.2d 343 (1976) (Marshall dissenting).

³²² *Brady v. Maryland*, 373 U.S. 83, 87, 83 S.Ct. 1194, 10 L.Ed.2d 215 (1963).

³²³ *Berger v. U.S.*, 295 U.S. 78, 55 S.Ct. 629, 79 L.Ed. 1314

monetary interest in the outcome of the matter. That risk is particularly high if the prosecutor has agreed to receive a contingent fee in the civil action."³²⁴ "Conflicting interests, moreover, can undermine a prosecutor's impartiality."³²⁵ "Also implicated are the [private] prosecutor's ethical obligation 'to see that the defendant is accorded procedural justice and that guilt is decided upon the basis of sufficient evidence.'"³²⁶

Draeger, of course, has a vested interest in protecting its multi-million dollar investment and the profits it seeks not only from this State but from other jurisdictions should the Alcotest receive this Court's imprimatur. The State, with its multi-million dollar investment in this new technology, has a similarly compelling interest in its approval, albeit moderated (one hopes) by its obligation to do justice.

To this end, this Court, working in tandem with defendants, must consistently seek to overcome "the natural tendency of the prosecutor to overlook evidence favorable to the defense, and [the] incentive for the prosecutor to resolve close questions of disclosure in favor of concealment."³²⁷ This Court must remain cognizant of even the appearance of impropriety engendered by Draeger's participation in a quasi-criminal proceeding.³²⁸

(1935); *U.S. v. Agurs*, *supra*, 427 U.S. at 110-11.

³²⁴ *State v. Storm*, 141 N.J. 245, 253-53 (1995).

³²⁵ *Id.* at 253.

³²⁶ *Id.*, citing *Model Rules of Professional Responsibility* 3.8, comment (1994).

³²⁷ *U.S. v. Agurs*, *supra*, 427 U.S. at 117 (Marshall dissenting).

³²⁸ See *State v. Storm*, *supra*, 141 N.J. at 253.

Has the Attorney General's failure to fully explore the computer program running the Alcotest 7110 MK-III-C deprived all Defendants in the present case and all other defendants similarly situated of a fair trial?³²⁹ Does providing defense counsel with a limited opportunity to partially inspect the software here a realistic way to assure due process for individual defendants in the future, given the extraordinary expense which may potentially fall on the individual defendant?

The answer to the question depends on (1) a review of the facts, (2) the defense request for the material and the limited opportunity to explore missing material, and (3) the standard by which the prosecution's failure to volunteer exculpatory material should be judged.³³⁰ Here, Defendants specifically requested the source code more than one year ago, so the standard by which the proponents' actions are judged is an objective one making any prosecutorial awareness of the evidence's exculpatory nature irrelevant. Thus, we need only review the facts on which the due process claim is made. In that vein, "the defendant must show that: (1) the prosecution [and its alter ego Draeger] suppressed evidence; (2) the evidence is favorable to the defense; and (3) the evidence is material."³³¹

Once again in reverse order, we examine these requirements:

³²⁹ See *U.S. v. Agurs*, *supra*, 427 U.S. at 98-99.

³³⁰ *Id.*, 427 U.S. at 99.

³³¹ *State v. Martini*, 160 N.J. 248, 268-69 (1999), citing *Brady v. Maryland*, *supra*; see also *State v. Parsons*, 341 N.J. Super. 448, 454 (App.Div. 2001), citing *Moore v. Illinois*, 408 U.S. 786, 794, 92 S.Ct. 2562, 33 L.Ed.2d 706 (1972).

First, information about the prerequisite conditions for establishing breath test reliability is highly relevant and extremely material.³³² Such evidence is material "if there is a reasonable probability that, had the evidence been disclosed to the defense, the result of the proceeding would have been different."³³³

Second, the evidence should be deemed favorable to the defense. A wide variety of materials in the State's possession could constitute exculpatory information to which a defendant is entitled.³³⁴ Specific discovery concerning the chemical testing machine is exculpatory, because this information is the only "alternate means" available to the defendant to debunk the reliability and accuracy of the chemical test result; and the Due Process Clause "require[s] that criminal defendants be afforded a meaningful opportunity to present a complete defense."³³⁵

Thus, we are left with the final question: Is the State and Draeger suppressing this material favorable evidence? "[I]f the omitted evidence creates a reasonable doubt that did not otherwise exist, constitutional error has been committed."³³⁶

Despite Draeger's disgorgement of source code pursuant to this Court's explicit direction, its processes remain hidden

³³² *State v. Ford*, 240 N.J.Super. 44, 50-51 (App.Div. 1990).

³³³ *Strickler v. Greene*, 527 U.S. 263, 280-81, 119 S.Ct. 1936, 144 L.Ed.2d 286 (1999) (citations omitted) (affirmed denial of habeas petition).

³³⁴ *State v. Ford*, *supra*, 240 N.J.Super. at 52.

³³⁵ *California v. Trombetta*, 467 U.S. 479, 485 and 490, 104 S.Ct. 2528, 81 L.Ed.2d 413 (1984).

³³⁶ *U.S. v. Agurs*, *supra*, 427 U.S. at 112.

within the billions of paths within the Code. Despite the limited reviews conducted within the limited time allotted by this Court, the interdependence of the EC and IR technologies remained hidden until a lucky exchange on cross examination. In the context of due process as discussed in this point, the EC/IR revelation sharpens the realization that so much more is hidden that, given the complexity and disorganization of the code, material exculpatory information will always remain undisclosed.

Aside from the unreliability issues discussed elsewhere in this brief, the code itself makes the State's use of the Alcotest a due process violation. How this Court handles this suppression of information at this juncture will affect the lives of the thousands of individuals whose cases are pending resolution of this matter. We cannot assess whether this machine's reported result will convict innocent people or free guilty ones. It will define how this landmark case is viewed by other jurisdictions. Accepting results from a device which, by its nature suppresses material relevant information will make New Jersey and this Court look foolish. There is but one remedy to this nonsense: Suppress results from all cases with Alcotest using firmware version 3.11.

CONCLUSION

What We Have Learned

We have learned a number of things in these hearings that no one other than Draeger knew or appreciated when we started.

First, the methodology expressed in Addendum A³³⁷ assumed but omitted reference to some standard by which the software house would examine the code. A cursory review where no concerted effort is made to find "obvious concerns" will yield a report with innocuous findings and conclusions which, on the surface, sound impressive but, on closer examination, mean nothing.

Second, no source code is error free. Code can be written in a way that makes it reliable. In reliable code, programmers constantly search for errors and, when found, correct them according to a systematic, standardized, well-thought-out method that is documented at every step. Each time a correction is made over the life of such code, it just gets better and better. Unfortunately, as discussed herein, Alcotest source code is *not* reliable and, when modified, gets worse and worse.³³⁸

Third, version 3.11 is rife with many errors, anyone of which, by itself, makes this code and this device unreliable. The present Alcotest is just as likely to produce results that

³³⁷ Da15, D-232.

³³⁸ In any event, the final step of the Addendum A protocol -- that the Alcotest be "tested against and measured in compliance with O.I.M.L. [International Organization of Legal Metrology] specifications adopted and current at the time of such tests" -- is not yet applicable to this case. See Da16, par.3.

inculcate the innocent and exculpate the guilty.³³⁹ The code, and, thus, the instrument itself, is not scientifically reliable. The right thing to do is to throw out all of its results from every case now pending.

Knowing the Right Thing and Doing It

Knowing the right thing and *doing* it are often two different things. Factors beyond the realm of objective scientific principles should not affect these decisions. The fear is that extraneous unrelated facts having nothing to do with Alcotest unreliability will dictate an unjust outcome to this case. Those facts relate to the way both the State and this Court have handled the Alcotest and disserved the public to date.

The State selected, approved, and implemented the Alcotest program improperly by (a) formulating a bid specification that permitted only one manufacturer's product and precluded any competition in the selection process, (b) delaying replacement of the antiquated Breathalyzer until it became so out of date that it could no longer be equipped or maintained or continued as a viable technology, (c) rolling out the Alcotest in such a reckless and overpowering way that it is now the only technology available for breath testing in most of New Jersey, and (d) ordering arbitrary changes to the source code such that range of agreement between breath test results would obscure issues third tests might otherwise flush out.

This Court disregarded well-established evidentiary

³³⁹ See, e.g., 9RT235-24/237-3.

principles and constitutional protections by, *inter alia*, (a) entering its January 2006 Order *sua sponte* without providing the parties with an opportunity to be heard, (b) requiring municipal courts to receive Alcotest results, (c) encompassing within the Order not only the present parties to the above captioned matter but all similarly situated defendants [*i.e.*, those defendants with cases involving Alcotest 7110 breath test evidence], (d) requiring defendants to face conviction based on unreliable incompetent evidence, (e) creating a presumption of guilt based on presumably incompetent evidence,³⁴⁰ (f) precluding the right of defendants to timely confront this evidence against them,³⁴¹ (g) causing undue prejudice, unfair trials, and collateral consequences like insurance premium increases, job loss, and driving privilege revocations for out-of-State drivers, and (h) unduly delaying dispositions and implicating the right to a speedy trial.³⁴²

An Untenable Situation

As a result, based on incompetent evidence, innocents have faced conviction and guilty people have been released. Those whose driving privileges should have been revoked were allowed to drive, and those whose driving privileges should *not* have been revoked lost jobs, went broke, failed friends and families. Some

³⁴⁰ *Romano v. Kimmelman, supra*, 96 N.J. at 90. See *In re Winship*, 397 U.S. 358, 364, 90 S.Ct. 1068, 25 L.Ed.2d 368 (1970).

³⁴¹ See *Pointer v. Texas, supra*, 380 U.S. at 406; see also *Crawford v. Washington, supra*, 541 U.S. at 59.

³⁴² See *State v. Farrell*, 320 N.J.Super. 425 (App.Div. 1999); *Barker v. Wingo*, 407 U.S. 514, 92 S.Ct. 2182, 33 L.Ed.2d 101

were jailed.

This Court's January 2006 Order compelled municipal courts to receive Alcotest readings into evidence, even though these hearings remained pending. Draeger, the State, and the Public might have reasonably assumed that acceptance of the Alcotest would be a foregone conclusion. Given the way the State and this Court have created an almost untenable situation in the administration of DUI defendants, the present Defendants are concerned that this Court will whitewash the terrible truth uncovered in this case and, to save face, not only convict innocent people but also create precedent that has the potential to infect our jurisprudence in any application relying on computerized scientific evidence.

Unfortunately, there is no easy, face-saving way to rationalize these extraneous mistakes away. This Court and the Attorney General can only acknowledge that mistakes were made, learn from them, and move on.

"The principle...is not punishment of society for misdeeds of a prosecutor but avoidance of an unfair trial to the accused."³⁴³ "Society wins not only when the guilty are convicted but when criminal trials are fair; our system of the administration of justice suffers when any accused is treated unfairly."³⁴⁴

(1972).

³⁴³ *Brady v. Maryland, supra*, 373 U.S. at 87.

³⁴⁴ *Id.*

The Only Reasonable Findings

Judge King's conclusions about source code reliability here are wrong: He should have drawn adverse inferences against Draeger for its stonewalling. Overwhelming evidence on remand undermines any confidence in supposed Alcotest reliability. The only reasonable findings this Court can make are these:

- The Alcotest 7110 using firmware version 3.11 is unreliable and unscientific.
- All Alcotest results in all prosecutions affected by this Court's January 2006 Order are excluded.
- Each case in which guilt is based on Alcotest results will be returned to the municipal court for trial or disposition as the requirements of the particular case require.

Respectfully submitted,

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