IN THE SUPREME COURT OF PENNSYLVANIA

Docket No. 75 MAP 2012

COMMONWEALTH OF PENNSYLVANIA,

Appellee

v.

GEORGE WILLIAM YOHE II,

Appellant.

# BRIEF AMICUS CURIAE OF THE NATIONAL COLLEGE FOR DUI DEFENSE ATTORNEYS IN SUPPORT OF APPELLANT

The National College for DUI Defense writes as a friend of the Court in support of Appellant's appeal from the Superior Court's Opinion, No. 315 MDA 2011, filed on February 16, 2012, published at 39 A.3d 381.

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## INTEREST OF AMICUS CURIAE

*Amicus Curiae* the National College for DUI Defense is a nonprofit professional organization of lawyers, with over 1,000 members, focusing on issues related to the defense of persons charged with driving under the influence. Through its educational programs, its website, and its email list, the College trains lawyers to more effectively represent persons accused of drunk driving.

## STATEMENT OF JURISDICTION

Amicus Curiae adopts the Appellant's Statement of Jurisdiction.

## ORDER IN QUESTION

Amicus Curiae adopts the Appellant's Order in Question.

## STATEMENT OF THE SCOPE AND STANDARD OF REVIEW

Amicus Curiae adopts the *Appellant's* statement of the scope and standard of review.

## STATEMENT OF THE QUESTION INVOLVED

Whether the Commonwealth's decision not to call the individual who physically performed a blood analysis of the Appellant's blood violated Appellant's rights under the Confrontation Clause.

*(Amicus Curiae suggested finding: yes. The Superior Court found in the negative.)*

## ARGUMENT OF *AMICUS CURIAE*[1]

### I. GAS CHROMATOGRAPHY TESTING FOR BLOOD ALCOHOL INVOLVES THE EXERCISE OF JUDGMENT AND PRESENTS A RISK OF ERROR BY THE ANALYST THAT CAN BE DISCOVERED ONLY THROUGH CROSS-EXAMINATION OF THE ACTUAL ANALYST WHO RAN THE TEST.

Appellant George William Yohe II was convicted of DUI under 75 Pa.C.S.A. § 3802(b) after a report stating the results of a blood alcohol analysis of 0.15% was admitted into evidence over a Confrontation Clause objection. At trial, rather than calling the analyst who actually conducted the test to introduce the evidence regarding Yohe's blood alcohol concentration, the prosecution called a supervisor who took no part in the blood alcohol analysis other than to review and sign the final report stating the result. Although the trial court granted a motion for a new trial, the Superior Court reversed that ruling, and this Court accepted review. This brief is filed to aid the Court in its understanding of gas chromatography, and why in the view of *Amici*, the actual analyst needs to be produced by the prosecution to satisfy the Confrontation Clause.

A blood alcohol analysis is a complex process that is performed using a gas chromatograph (GC).[2] GC is not like a cash register, where anyone can enter numbers and get a receipt with the total amount. Rather, GC is highly technical, complicated, and vulnerable to the

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[1] This brief is copied almost verbatim with very minor changes from the amicus brief that was filed by *Amicus Curiae*, along with the National Association Of Criminal Defense Lawyers and the New Mexico Criminal Defense Lawyers Association in *Bullcoming v. New Mexico*, 131 S.Ct. 2705 (2011). The author of this brief was a lead editor and author of that brief. The authors of that brief also include counsel for the Appellant, Justin J. McShane, as well as Barbara E. Bergman, Molly Schmidt-Nowara, Alexandra Freedman Smith for The National Association of Criminal Defense Lawyers, and Ronald L. Moore for The National College For DUI Defense. Todd Wertheim, and Trace Raybern for the New Mexico Criminal Defense Lawyers Association also signed on to the brief. The co-authors have given their permission to this use of their brief.

[2] In this brief "GC" is used interchangeably to describe gas chromatography, the process, and the gas chromatograph device.

possibility of error or fraud, including the ability to surreptitiously manipulate the data. Therefore, this Court should find that only the opportunity to cross-examine the actual analyst who ran the test satisfies the Confrontation Clause.

### A. Overview Of How The Gas Chromatograph Test Works To Determine Blood Alcohol Content.

GC is a method of separating a complex mixture into its component parts and quantifying them after separation.[3] *See generally* Harold M. McNair & James M. Miller, *Basic Gas Chromatography* (John Wiley and Sons, 2d ed. 2009); David T. Stafford, *Chromatography, in Principles of Forensic Toxicology* 89 (Barry Levine ed., 4th ed. 2003).[4] A carefully prepared blood sample from the defendant is placed into a small vial. This vial is typically loaded into a carousel that holds many vials that are placed in the GC[5] for a single run. *See* Appendix A. At least three vials of known standards – prepared samples of ethanol[6] where the concentration of ethanol in each standard is known (the external standards) – are also placed in the GC. Vials containing water (water blanks) are also placed in the GC. Each vial other than the water blanks is also injected with precisely the same amount of a similar substance not expected in the sample, usually n-propanol, to serve as an internal standard. The purpose of the internal standard, if performed properly, is to help ensure that the reported results are precise and accurate. It is an important safeguard against an invalid result. As there is a known amount of internal standard

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[3] GC separates volatile substances, i.e., that are capable of being vaporized.

[4] The discussion in Section I regarding how GC works is based on the information in these treatises.

[5] The carousel is part of an autosampler that attaches to the GC and automatically samples multiple vials in sequence.

[6] Ethyl alcohol or ethanol is the type of alcohol found in alcoholic beverages. Ethanol will primarily be used in this brief to avoid confusion with other types of alcohol such as methanol or isopropyl alcohol.

added to every test vial, if over the course of sampling one vial has more or less internal standard than there should be, then the result (meaning the ethanol amount) is scaled or corrected to account for error. If an incorrect amount of internal standard is added, the surrogate may not know about this dangerous form of error that could result in invalid results being reported as valid results.

The GC machine injects a single syringe through the rubber *septa* into the closed vials in sequence to remove a small amount of the gas in the top of each vial above the liquid (this is known as the *headspace gas*). To move this sampled gas into the machine for analysis, there must be pressure to force it to move. This sampled gas is transferred or pushed by a carrier gas, usually helium, into the *column*. Initially, the gas that is pushed into the GC contains different compounds that are widely dispersed throughout the sample.

The GC *capillary column* (the kind of column most frequently used in forensic blood alcohol testing) is an almost hair thin and feather light hollow coil that is installed in the GC oven, and is coated on the inside with a film of a chemical designed to interact with the injected gas.[7] McNair & Miller, *supra*, at 85. The inner coating is referred to as the stationary phase.[8] The gas moves under constant pressure and temperature causing the different molecules in the gas, most importantly the ethanol, to group together uniquely and move at unique rates of speed

[7] The column length and width, the thickness of the film, and the installation of the column all affect the results. After repeated use, the ends of the columns, which in this kind of testing are usually around 30 meters long, may become dirty, need to be clipped in a specified manner so as to eliminate the chance of contamination, and reinstalled in the gas chromatograph. Only the analyst knows how the clipping or the installation occurred. *See* David T. Stafford, *Forensic Capillary Gas Chromatography, in Forensic Science Handbook, Vol. II*, at 46 (Richard Saferstein ed., Prentice Hall 1988).

[8] Scientists use a number of terms in connection with GC in ways that may be confusing to lay persons. For example, the term "phase" as used here is a noun, and does not refer to a stage of development like adolescence.

from other like molecules, based on their interactions with the stationary phase of the column. *Id.* The mixture of chemicals in the sample gas separates into the different molecules that make up the gas. Each of these separated groups of molecules will then be pushed to a detector at the end of the column. The detector does not sense what each chemical is, or how much of that chemical is present in the sample. Instead, it detects when a group of like molecules emerges and the relative amount of these molecules compared to the other chemicals in the sample gas. It is literally a flame that is ignited throughout the analysis. As the molecules pass through the flame, they are burned. It is the relative change in the intensity of the flame that is measured.[9] A computer then takes this raw data and creates a separate chromatogram for each vial in the run.[10]

The chromatogram is a graph that shows when each molecule makes contact with the detector at the end of the column. Different kinds of molecules will reach the detector to be burned at different rates depending on the size, shape, and other properties. The *retention time* is the length of time that it takes the separated compound to go from injection to detection through the gas chromatograph. Each different chemical component will exit the column at a different rate. The chromatogram is a graph that ideally shows sharp, symmetrical peaks at different

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[9] Technically, a device called a flame ionization detector (FID), burns the compounds as they exit the column, and creates ions which are measured by the FID. FIDs are the most commonly used detectors in GC testing for blood alcohol content. Stafford, Chromatography, supra, at 103-104.

[10] The GC process described is known as indirect headspace gas chromatography. This is the most prevalent type of GC testing for blood alcohol concentration. However, there is another method of GC called direct injection chromatography where a sample is injected directly into the heated injector port and the liquid vaporizes instantly into a gas. Then the gas is pushed into the GC column and measured in the same way it is measured in indirect headspace gas chromatography.

points in time representing the different kinds of molecules emerging from the column. *See* Appendix B. The time it takes for a peak to appear in the known samples of ethanol is then compared with the chromatogram for the defendant's sample. If a peak appears in the defendant's sample at the same time that the peak appears in the known ethanol samples, then the defendant's blood sample also contains ethanol. Thus, determining whether ethanol is present in the defendant's blood sample is done by comparison to the known ethanol standards – it is not simply sensed by the GC.

A helpful analogy used to explain how a GC works is the ball analogy. Imagine you live in a house that has a downward-sloping driveway. At the bottom of this driveway, you put a pile of different types of balls, which rest there. Assume that this pile includes all different types, kinds, and sizes of balls, with different surface areas and textures, such as ball bearings, marbles, ping-pong balls, golf balls, whiffle balls, handballs, tennis balls, hockey pucks, baseballs, soccer balls, volleyballs, basketballs, footballs, and bowling balls. The balls represent each different chemical component in a mixture. You want to find the bowling ball, so you can go bowling later in the afternoon, but you are blindfolded. The bowling ball represents the ethanol in a mixture. You are not allowed to touch the group of balls, but you have a tool to help separate them out: a leaf blower. You know that based upon a distinctive attribute (in this case, its weight), it will take a very powerful leaf blower to cause the bowling ball to move, in contrast, for example, to the whiffle ball. You attempt to move this motley collection of balls up the driveway with a normal leaf blower. Some of the pile will quickly move to the top of the driveway, some balls will migrate at varying speeds, and some balls may take an eternity to reach the end of the driveway, including the bowling ball.

The difference in the time that each type of ball takes to travel to the top depends upon

the characteristics of each ball, such as the surface area, the weight, etc. Obviously, the lighter balls travel more quickly. The heavier ones might take much longer. Some balls may take longer due to their shape, like the hockey puck or the football. In addition, the different balls interact with one another, as they are pushed by the air from the leaf blower, and this interaction may hinder or accelerate the travel of different balls in different ways. The surface characteristics of the ball, such as a fuzzy versus a smooth texture, may also be important, as in the examples of the tennis ball and golf ball. Even the temperature and composition of the driveway itself may lend itself to the relative migrating speed of balls with certain characteristics, while retarding the progress of others. Studying all of these many separate physical events that affect the speed at which various balls make it to the top of the driveway would produce a sort of "separation science." Once all of the variables and characteristics were established, and the resulting speed of each ball was noted, then one should be able to do the reverse. In other words, if a person begins by measuring the speed with which a given ball has reached the top, then he or she should be able to extrapolate the ball's unique characteristics, identifying it as a tennis ball, a golf ball, or the sought-after bowling ball.[11]

GC not only determines whether ethanol is present in the defendant's blood sample, but also how much ethanol is in the blood sample – or the concentration. To determine the concentration, the area of the peak that represents ethanol on the chromatogram is measured. Each peak is ideally like a sharp, steep triangle.[12] The greater the area of this triangle, the greater the amount of ethanol is present in the defendant's blood sample. *See* Appendix B. The

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[11] This analogy can be attributed to Dr. Harold McNair, Ph.D., professor emeritus at Virginia Tech.

[12] The peak is actually a bell curve representing how much of the separated substance is detected at a given time from its injection into the GC.

computer that is either in or attached to the GC may make corrections to the size of the unknown sample's peak based on a comparison of the internal standard in the subject sample to the internal standard measurement in the other samples, if the internal standard measurement is not exactly the same in every result. *See* Appendix C.

It is important to note that the area under the peak represents the concentration. How one determines the area is crucial to the end result as more area results in a higher concentration. The baseline is critical in the calculation of the area as it is the boundary of that measurement. *See* Appendix D. The analyst can tell the computer how to draw the baseline of the peak. *See* Appendix E. It is part of the *method*[13] typically or can be something that is performed on a peak-by-peak basis. This is a wholly subjective task. In forensic science and even in industry there are no universal guidelines as to how to determine the baseline of a peak. The computer can also draw the baseline of the peak. If there are irregularities in the shape of the peak – it is not precisely symmetrical, or two peaks overlap – these baseline calculations may be erroneous. *See* Appendix F. The software also permits the analyst to override the method and manually redraw the baseline. With rare exceptions, the reporting of the baseline and what parameters the analyst used in determining the baseline are not reported or known to anyone else.

The area of the peak is then compared to at least three known ethanol standards that are plotted on a graph in what is called a *calibration curve*.[14] Richard Erwin, *Defense of Drunk Driving Cases: Criminal/Civil* at 17-31 (Matthew Bender, 3d ed. 2007). If one known ethanol standard is a sample with .08% ethanol, and another is .16% ethanol, and another is .32%

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[13] "Method" in this context is the term used by the computer software for the computer program the analyst must select that contains the parameters used in the test.

[14] Again, the scientific nomenclature can be confusing to lay persons. The calibration curve should actually be a straight line.

ethanol, then the area of the peak from the defendant's blood sample is measured against the calibration curve from the known ethanol standards. The unknown sample (the defendant's sample) must also be within the lowest and highest known external standards for a valid result. Stafford, *Chromatography*, *supra*, at 115.

The software in the GC's computer will analyze the chromatograms and determine if, when compared to the known ethanol standards, ethanol is present in the defendant's blood sample and what the blood ethanol concentration is in the sample compared to the known ethanol standards. Erwin, *supra*, at 17-35. The machine prints out the actual chromatogram and a result based on its calculations.

The results calculated by the computer, however, are not necessarily valid. Many different factors in the control of the analyst can affect the validity of the results. GC is a process that requires several steps. Each tier of the process of testing by GC involves the exercise of judgment and proper technique, and presents a risk of error by the analyst that can be disclosed only through cross-examination of the actual analyst who performed those steps in sample preparation. First, the analyst must *prepare* sample vials for GC by pipetting[15] precise amounts of samples, internal standards, calibrators, or controls into the vials and then sealing them. Second, he or she must properly load the vials into the machine. Third, the analyst must select the proper parameters that will be used to run the test. Finally, he or she must interpret the results (called integration). Human error can occur during each of these stages of the test

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[15] "Pipetting" is a technique where a chemist uses a prop erly calibrated pipette – a small tube with suction on one end (like a tiny turkey baster) – to extract a minute (usually 1 milliliter in this context) and precise volume of liquid from one container into a vial. Today's pipettes are more sophisticated than turkey basters, and contain dials to specify the desired amount of liquid to be pipetted. But pinpoint accurate pipetting still requires training and is susceptible to error.

## B. How An Analyst Can Make Errors During The GC Test That Would Be Unknown By A Surrogate Analyst Testifying At Trial

### 1. Step One: Preparation Of The Sample

The process of analysis of ethanol in the blood by GC begins long before the instrument analyzes the sample. Preparing the sample that will be analyzed by the GC machine requires several steps. First, on receipt of the specimen, the analyst should ensure that the identifying information on the sample corresponds to its packaging. Next, the analyst should look for conditions that could affect the reliability of the analysis including leaks, blood volume, clotting, and signs of fermentation. A.W. Jones & J. Schuberth, *Computer Aided Headspace Gas Chromatography Applied to Blood Alcohol Analysis: Importance of Online Process Control*, 34 J. Foren. Sci. 1116 (1989). Clotting will lead to a false high result, because the standards that the unknown are compared against are designed to test for whole blood and not the serum resulting from clotting. Fermentation can lead to a false high result because ethanol can actually be created in the sample after it is withdrawn from the defendant. Philip Blume & David J. Lakatua, *The Effect of Microbial Contamination of the Blood Sample on the Determination of Ethanol Levels in Serum*, 60 Am. J. Clin. Path. 700, 701 (1973).

It is completely within the judgment and diligence of the analyst whether any condition observed rises to a level that needs to be documented, and whether any indication of such condition will ultimately appear on a report or other documents reviewed by a subsequent reviewer. Moreover, the analyst must be trained to be aware that these conditions may affect a test result. It is the lack of this awareness that can be skillfully exposed only by cross-examination of the analyst.

Then appropriate known ethanol standards must be selected which have been properly prepared and preserved, are within their useful shelf life, and remain within acceptable precision and bias. This includes the ethanol standards of known concentration and the internal standard against which the unknowns will be measured. Next, the specimens and standards must be allowed to reach room temperature. Unequal temperature may lead to unequal sampling volumes. If the volume of the defendant's blood sample is different from the known ethanol standards, then the results will be invalid. All of the vials must contain the same volume of liquid for the test to work properly. In addition, the specimens should be rocked or gently inverted to assure the sample is homogenous. Jones & Schuberth, *supra*. However, if the vials are vigorously shaken, this can cause bubbles in the sample that will increase the volume of the sample and lead to invalid results.

The analyst must then properly prepare the vials that go into the autosampler. The analyst, using a properly calibrated pipette, must introduce the blood and the external standards into the separate 20 milliliter (ml) headspace vials. Then, also using a pipette, he or she introduces a precise volume of internal standard into every vial, with the exception of the water blank vials. The manual pipetting of these solutions in such small volumes is inherently fraught with the potential for error. Care must be exercised to assure consistent samplings of both the specimen and the internal standard. Consistency is critical to precision and reproducibility. M.J. Luckey, *Headspace Analysis for Ethyl Alcohol in Blood, Breath, and Urine Specimens Using a Specialized Gas Chromatograph*, 16 J. Foren. Sci. 120 (1971). This depends entirely on the pipetting technique of the analyst. In addition, the final mixtures that are introduced into the vials are never directly measured and validated prior to the run to confirm that the volume or the mixture was correct. For this reason, pipetting may well be the Achilles' heel of blood alcohol

testing. Additionally, if a reusable pipetting system is employed, special care must be taken to prevent contamination. Questioning the actual analyst who prepared the vials is essential to uncover pipetting errors.

**2. Step Two: Loading The Machine**

It is also important that the GC vials are loaded in the machine correctly. The GC vials must be identified as to their order and contents. Jones & Schuberth, *supra.* "Special precautions must be taken to eliminate the risk of mix-up of samples and to ensure a high degree of quality control of the day-to-day analytical results." *Id.* at 1125.

Such special precautions include that "the positions of samples and standards, the identity of the samples, the concentration of standard and the instrument number are all entered into the computer and carefully checked for possible misidentification." H.M. Stone, et al., *Blood Alcohol Analysis by Semi-Automated Computerized Gas Chromatography, in Alcohol, Drugs, and the New Zealand Driver* 17-18 (Dep't of Scientific and Indus. Research, DSIR Bulletin 232) (1982). The proper labeling and placement of the vials in the autosampler is not only necessary to determine which blood samples belong to which defendants, but it is also essential that sufficient calibrators, controls, and water blanks be placed in their proper places in the autosampler to protect the integrity of the test. Additionally, sufficient water blanks must be dispersed throughout the auto-sampler to provide assurances against contamination between samples and in the equipment. A salt such as sodium chloride is sometimes added to force extra ethanol and internal standard into the headspace gas. D.S. Christmore, et al., *Improved Recovery and Stability of Ethanol in Automated Headspace Analysis*, 29 J. Foren. Sci. 1038 (1984). Variations in the amount of salt introduced can cause invalid results. B.L. Glendening & R.A. Harvey, *A Simple Method Using Head-Space Gas for Determination of Blood Alcohol*

*by Gas Chromatography*, 14 J. Foren. Sci. 136 (1969). Once again, the correct performance of these activities lies only within the personal knowledge of the person who performs them. *Id.*

### 3. Step Three: Selecting The Test Parameters

There are several variables in the test that can affect the results. The way an analyst controls these variables depends on the method of GC used. There are two common methods for introducing the sample into the column of the GC. *Direct injection* chromatography involves injecting the sample directly into a heated injector port, which is set at a temperature calculated to instantly vaporize the sample into a complex gaseous mixture to be separated. The temperature of the oven and column can be regulated by control software that requires analyst input to reduce temperature fluctuations that affect retention time. Additionally, some direct injection methods cause build-up of contaminants in the instrument, which must be periodically cleaned or replaced, and care must be taken to clean the syringe between injections. Glendening & Harvey, *supra*; see also K.D. Parker, et al., *Gas Chromatographic Determination of Ethyl Alcohol in Blood for Medico-Legal Purposes*, 34 Anal. Chem. 1234 (1962).

The second, and most common method of GC analysis, is *indirect* or *headspace gas chromatography* (HS-GC). This is the method explained previously in section IA. When this method is used, the defendant's prepared blood sample vial is inserted typically into an autosampler in its proper place with the known ethanol standards and the water blanks. The indirect GC requires that all variables, including temperature, pressure, and flow of the gas through the machine, be kept constant throughout the test. If there are pressure leaks, temperature variations, or changes in the rate of the flow of gas during the test, the results will be skewed because the area of the peaks upon which the accurate quantitation depends will be altered, and a seemingly valid result will be invalid.

Once the carefully prepared samples are placed in the correct positions in the autosampler, the analyst must select the appropriate computer program, called the method, to drive the sample through the instrument. The program specifies the parameters that govern the test. However, the analyst can also individually set these parameters overriding the installed method. These critical components of the test include, but are not limited to, pressure, the way the samples are shaken, incubation period and variables surrounding the headspace vial, the temperature of the injection port, the temperature of the oven that contains the column, the temperature of the detector, the flow rate, and the *split ratio*.[16] A surrogate analyst will not know if the actual analyst changed any of the test parameters or the reasons for doing this. It is essential that the defense attorney be permitted to question the analyst about the parameters used during the test to determine if the results of the test are valid.

Moreover, an autosampler uses a single injector needle, which is reused with every sample. This invites the possibility of sample carryover contamination. The precautions the analyst takes to protect against contamination, known only to the analyst, are also important.

Many laboratories today use duplicate testing with *dual columns* as an additional check of accuracy and reliability, where all samples are split and tested once through each column. It is important to note that each column is different in length and inner coating, and represents a completely separate set of parameters. Only the final result from each individual column can be compared for purposes of assessing accuracy and validity. A few laboratories even go so far as

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[16] The "split ratio" is the ratio of the amount of gas that the machine will use to push through the GC column and test versus the amount of gas it will discard through a specially designed filter of sorts called a split injector. Only a minute amount of the gas extracted from the headspace vial actually goes through the GC column.

to have each blood specimen tested by two different analysts, using two different pipetting systems, and two batches of internal standard, and on separate gas chromatographs, in order to completely isolate and detect individual errors in technique.

**4. Step Four: Interpretation Of The Results**

The GC measures the rate at which the chemicals in the sample emerge. This data is collected by the computer, but not reported in its "raw" form, but rather interpreted and manipulated by the software that is the reporting system whose variables are loaded and can be changed by the analyst at any time, even after testing is completed. It is only after this software interpretation that calculation of the peak areas occurs which determines the concentration of ethanol in the defendant's blood sample.

Importantly, the software, which is designed to *correct* for anomalies in the testing procedure, sometimes adjusts the results incorrectly. These corrections are not always correct and must be carefully monitored. One way errors can occur is through a redrawing of the baseline by the computer or the analyst if the peaks are not precisely symmetrical or where the peaks overlap and relate to more than one substance. In this way, the software allows for manipulation of the raw data by the computer or the analyst. Thus, rather than doing the scientifically honest thing and noting the anomalies, determining the source of the error, fixing any problems that would cause problematic results, and retesting over again, an analyst could simply manipulate any resulting anomalies in the chromatogram to make it appear normal and in line with the analyst's preferred or expected results. Skillful cross-examination of the actual analyst could expose these errors, of which a surrogate analyst would likely have no knowledge.

Accurate and valid results depend upon the knowledge of the analyst to perform the protocol correctly, the integrity of the analyst to not improperly modify the results in one way or

another, and the prior calibration with ethanol standards of known concentration being completed properly. The critical steps upon which the ultimate accuracy relies occur early in the preparation of the sample for analysis. Mistakes made by the analyst are not necessarily discernable to anyone else. Achieving results as close as possible to the true amount requires precision and uniformity throughout the testing procedure. Questioning the actual analyst about the way he or she conducted the test or typically conducts a test is necessary to determine whether the results are accurate and reliable.

## II. A PROPER CROSS-EXAMINATION WOULD INCLUDE QUESTIONS THAT ONLY THE ACTUAL ANALYST COULD ANSWER.

In *Amici*'s experience, there are numerous areas of cross-examination the defense could pursue with the actual analyst in a case involving blood alcohol concentration, questions the substitute analyst would not be able to answer. The answers to these questions would assist the fact-finder in determining the reliability of the evidence and the credibility of the witness. Cross-examination questions about the analyst's training and methodology – as opposed to a substitute analyst regurgitating textbook laboratory protocols – may reveal significant flaws in the testing.

For example, questions about the analyst's training record may reveal improper training by a predecessor or training to operate a machine different than the one used to test the blood at issue. Questions about an analyst's employment history might uncover a history of botched test results. Questions about how the analyst generally performs the testing might show that the analyst does not follow laboratory's protocols. The defense may want to know what time of day the analyst tested the sample, whether the analyst left the room while the sample ran through the machine, or whether the particular machine used had malfunctioned recently.

Defense counsel could ask only the analyst specific questions about the actual testing of a

defendant's blood, including, but not limited to the following:

- What qualifications does the analyst have? What is the analyst's educational background? Has the analyst ever been disciplined or fired? Has the analyst been properly trained? Has the analyst participated in proficiency testing? When? What were the results?

- Prior to beginning the sampling process, what was the condition of the specimen? Was there any leakage? What was the specimen volume, and is that volume typical for the tube submitted? Was there any clotting in the sample? Were there any signs of fermentation? Are you familiar with how these factors might affect the accuracy of the test?

- How did the analyst document these or other conditions and when in the analyst's judgment do they become significant enough to document?

- Where is such documentation recorded, and where is it kept?

- When the specimen was mixed, how was it mixed? Was the sample rocked on a mechanical rocker, inverted by hand, or shaken? Did the process used introduce bubbles into the specimen, aerating the sample and creating volume differences in sampling?

- What method of GC was used, indirect or direct injection?

- When the specimen was pipetted into the GC vial, how was that accomplished? Did the analyst use recycled pipette tips? If so, did he or she clean them between uses? How did the analyst ensure that he or she is pipetting consistent amounts of liquid into the vials? How does the analyst determine that the correct amount of internal standard is pipetted into the vials?

- What did the analyst do to assure that the correct sequence of specimen identification was entered into the run table of the computer that matches the GC output to the sample identification? How would the analyst know if he or she had made a mistake in entering this

- information? How is the information entered, manually, by bar code, or some other method?

- Did the analyst use a salt solution during the test? If so, why? How much?

- Did the analyst use the standard parameters used by the computer program? If so, does this ever result in problematic peaks on the chromatogram? Did the analyst manually enter the parameters? If so, why? Does the analyst ever change the parameters? Why or why not?

- Did the analyst observe any anomalies in the test results? What does the analyst typically do when he or she notices anomalies? Were any changes made in the computer or instrument program? Were all of the peaks symmetrical and separate? What does the analyst do when the peaks are not symmetrical and separate? Was the baseline consistent throughout the results? If not, what did the analyst do? Did the analyst alter the results to make them appear normal? Did the computer make any corrections on this test result? If so, what were they? How could these affect the results of the test?

Guaranteeing criminal defendants the right to cross-examine forensic analysts would not mean that the right would be exercised in every case in which the prosecution seeks to introduce forensic evidence. *Melendez-Diaz v. Massachusetts,* 557 U.S. 305 (2009). In many cases, criminal defendants do not go to trial or do not challenge the forensic evidence introduced by the prosecution. But cross-examination of forensic analysts is, in many cases, an essential tool to assist the fact-finder in assessing the reliability of evidence.

## III. RECENT CASES CONFIRM THE POTENTIAL FOR ERROR IN FORENSIC LABORATORY REPORTS.

Under the Superior Court's rationale, one analyst is as good as another for purposes of protecting the defendant's right to confrontation. However, "[t]he central concern of the Confrontation Clause is to ensure the reliability of the evidence against a criminal defendant by subjecting it to rigorous testing in the context of an adversary proceeding before the trier of fact." *Maryland v. Craig*, 497 U.S. 836, 845 (1990). The Confrontation Clause requires that "reliability be assessed in a particular manner: by testing in the crucible of cross-examination."

*Crawford v. Washington*, 541 U.S. 36, 61 (2004). As this Court recognized in *Green v. California*, 399 U.S. 149, 158 (1970), cross-examination is "the greatest legal engine ever invented for the discovery of truth." However, a surrogate witness cannot be meaningfully cross-examined.

Cross-examining a surrogate witness is like cross-examining a textbook – an attorney can only discover what should have happened rather than what actually happened. This does not assist the fact-finder or the search for the truth. If the actual analyst who performed the blood alcohol analysis strayed from the accepted procedure for conducting the test, or routinely disregards certain protocols, the defendant cannot discover this from cross-examining the surrogate. Moreover, if anything strange happens during a defendant's test, such as a power outage, or machine failure, a surrogate cannot know about it. The general procedure of the test and systemic problems with the type of test can be explored, but the specific problems related to the actual test performed, the actual machine used, and the actual analyst who conducted the test are left unknown.

The Superior Court's holding would also encourage crime labs to hire professional witnesses. If any expert familiar with the general procedures of the forensic test can testify rather than the analyst who actually performed the test, then laboratories could hire one or more professional witnesses who never perform analyses, but instead appear in court to testify. These professional witnesses could have excellent credentials, while the actual analysts' background and training would remain a mystery. The professional witness could have an excellent courtroom demeanor and appear knowledgeable and authoritative. This presents a dangerous situation for the defendant. Not only would the defendant be unable to discover any information about the actual test that produced damning evidence in his case, but he would also have a person

who appears to have great authority presenting that evidence to the judge or jury. This professional expert would be completely immune to cross-examination as to the actual test performed, but would present a rendition of testing procedure that would sound scientifically credible. In Amici's experience, this is precisely what some forensic crime labs do: use only a supervisor to testify, who is insulated from effective cross-examination. This nightmarish scenario turns the Confrontation Clause on its head because it allows the prosecution to present an idealized version of the forensic test with no way to discover what actually occurred through cross-examination. Additionally, allowing a surrogate analyst to testify insulates the actual analyst from ever being put through the "crucible of cross-examination." *Melendez-Diaz*, 129 S. Ct. at 2536. The analyst who is either conducting fraud, cutting corners or, more likely, who is improperly or incompletely trained has no fear of public exposure. Requiring the actual analyst to testify at trial provides incentive that the tests are performed correctly. Not only does "the prospect of confrontation . . . deter fraudulent analysis," id. at 2537, but it also deters careless analysis. The analyst will know that he or she will have to defend the analysis in court, and this will, in turn, lead to more accurate results.

As the Supreme Court recognized in *Melendez-Diaz*, confrontation is the best instrument to uncover ignorance, incompetence, mistake, or even fraud in the context of forensic science. 129 S. Ct. at 2536. Despite the aura of reliability that science lends them, forensic laboratory reports are as prone to error and fraud as the *ex parte* affidavits the Confrontation Clause was designed to prohibit. "Forensic evidence is not uniquely immune from the risk of manipulation." *Melendez-Diaz*, 129 S. Ct. at 2536. The recent report by the National Research Council of the National Academies, *Strengthening Forensic Sciences in the United States: a Path Forward* (2009) (NAS Report), confirmed what defense lawyers have long known: because forensic

analysis is a product of human discretion, it is vulnerable to incompetence, error and sometimes even fraud. *See also* Solomon Moore, *Science Found Wanting in Nation's Crime Labs*, N.Y. Times, Feb. 5, 2009, available at http://www.nytimes.com/2009/02/05/us/05forensics.html (last visited Dec. 1, 2010). As the NAS Report revealed, forensic analyses "are often handled by poorly trained technicians who then exaggerate the accuracy of their methods in court." *Id.* The NAS Report verifies that forensic science is anything but infallible, and is instead fraught by very human errors leading to problems such as sample contamination and inaccurate reports. *Id.*

Cross-examination is the best mechanism to "weed out not only the fraudulent analyst, but the incompetent one as well." *Melendez-Diaz*, 129 S. Ct. at 2537. In many cases, cross-examining the actual analyst who produced the inculpatory evidence as to acts or omissions is the only way to reveal the problems in testing in a given case because of problems with internal controls in laboratory and the lack of other forms of oversight. Solomon Moore, *Science Found Wanting in Nation's Crime Labs*, N.Y. Times, Feb. 5, 2009. Moreover, if the Court were to adopt the Superior Court's reasoning, it would not be limited to simply BAC tests, but other types of forensic testing, including DNA analysis, drug testing, etc. Forensic evidence is particularly damning evidence and is increasingly ubiquitous in criminal trials. Many jurors – perhaps the majority of jurors – now expect to hear about scientific evidence, placing an increasing pressure on prosecutors to rely heavily on such evidence. Hon. Donald E. Shelton, *A Study of Juror Expectations and Demands Concerning Scientific Evidence: Does the "CSI Effect" Exist?*, 9 Vand. J. Ent. & Tech. Law 331, 363 (2006). But if the Court accepts the lower court's test, the prosecution will be permitted to introduce highly prejudicial and inaccurate forensic evidence without any meaningful challenge from defense counsel. The harm created by such a system is obvious. In an increasing number of cases, the fact-finder's decision

of guilt or innocence hinges on forensic evidence. Imagine, for example, a common scenario in DUI cases: the blood analysis report states that the defendant's BAC was.08 (the level at which a defendant is presumptively impaired under many DUI statutes), but the defendant vigorously disputes that he had any alcohol the entire night. One reasonable explanation for the inconsistency is that the laboratory analyzing the defendant's blood either intentionally or negligently reported false results. That information could only be revealed through cross-examination of the actual analyst who conducted the testing, but if the defense is deprived of the opportunity to cross-examine the actual analyst, it is likely the defendant would be convicted. Cross-examination is one of the few proven and effective ways to prevent a wrongful conviction based on a forensic analyst's faulty methodology.

*Amici*'s fear of inaccurate forensic test results being admitted at trial is grounded in reality. A few recent incidents in DUI cases around the country show that blood analysis identical to the type used in this case is vulnerable to error or even fraud. For example, a recent investigation conducted by the Colorado Springs Police Department's Metro Crime Lab discovered 206 false high blood alcohol tests in 2007 and 2009 alone, all attributable to a single chemist. John Ensslin, *Final tally on flawed DUI: 206 errors, 9 tossed or reduced*, Colo. Springs Gazette, Apr. 19, 2010, available at www.gazette.com/articles/ report-97354-police-discuss.html (last visited on Nov. 26, 2010). Nine DUI convictions were dismissed as a result, but it is impossible to know how many individuals were erroneously convicted. Id. The investigation revealed that a particular chemist had inserted low levels of n-propanol into many of her blood samples, resulting in a correspondingly higher calculation for the ethanol levels in the samples. Anthony Lane, *Unsolved Mysteries in the CSPD's Crime Lab*, Colo. Springs Indep., Apr. 19, 2010, *available at* http://www.csindy.com/colorado/unsolved

mysteries/content?oid=1699431 (last visited on Nov. 27, 2010). Yet "going back to 2002, supervisors consistently rated [the chemist] as 'effective' or 'excellent,' with no hint of problems." Id. The improper addition of the internal standard could have been discovered through cross-examination.

Other instances of ethanol testing errors have been reported in the press. For example, in Tooele County, Utah, a driver who had consumed no alcohol was reported to have a 0.19 blood alcohol level. Retesting produced 0.00 results. Subsequent review showed that the analyst had improperly transposed numbers, resulting in the erroneous reading. Nicole Gonzales & Marc Giauque, *Homicide Charge Dropped Following Blood Test Mistake*, Jan. 28, 2009, available at http://www.ksl.com/?nid=148&sid=5442828 (last visited on Nov. 24, 2010). In Washington State, the supervisor of the State Police toxicology laboratory was found to have falsified certifications that she had tested solutions used to calibrate and test breath alcohol machines. Other individuals in the laboratory covered up the fraud. *City of Seattle v. Holifield*, No. 83277-3, 2010 WL 4008889 (Wash. Oct. 14, 2010); see also Tracy Johnson & Daniel Lathrop, *Allegations May Cast Cloud Over DUI Cases: State lab manager quits after she is accused of signing false statements*, Jul. 31, 2007, available at http://www.seattlepi.com/local/325706_dui31.html (last visited on Nov. 25, 2010). See also Jaxon Van Derbeken, Lab Employee to Take the 5th in DUI Trial, S.F. Chron., Apr. 7, 2010 at C1; Mark Alesia and Tim Evans, *Toxicology gaffes likely to affect cases*, Dec. 6, 2010, *available at* http://wap.indystar.com/detail.jsp?key=774876&rc =th&full=1 (last visited on Dec. 6, 2010).

Most recently, newspapers have reported the indictment of a chemist in Massachusetts who is alleged to have lied in test reports, putting up to 34,000 cases at risk. *E.g. For Mass. lab chemist, and unlikely road to scandal,* Oct. 15, 2012, boston.com,

http://www.boston.com/news/local/massachusetts/2012/10/15/for-mass-lab-chemist-unlikely-road-scandal/bv4bGE437pakb39WBIN2dP/story.html (last visited on Oct. 25, 2012); *Chemist pleads fifth in drug case*, Boston Globe, Oct. 10, 2012, http://www.bostonglobe.com/2012/10/10/chemist-center-closed-drug-lab-scandal-refuses-testify-roxbury-district-court/5yoknFtEXLetAcGR3kBC2I/story.html, (last visited Oct. 25, 2012); *Annie Dookhan Drug Lab Scandal: 500 Defendants Face Release After Faked Drug Tests*, Huffington Post, Oct. 6, 2012, http://www.huffingtonpost.com/2012/10/06/annie-dookhan-drug-lab-scandal-500-released_n_1944804.html (last visited Oct. 15, 2012).

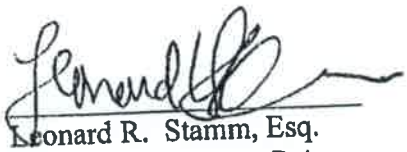
Those real-world examples demonstrate the danger of inaccurate test results being introduced at trial, as well as the importance of being able to cross-examine the actual analyst who did the work in a case. The Commonwealth here never disclosed why it did not have the actual analyst sign the report or appear in court. The truth may never be revealed because the analyst was not subjected to the crucible of cross-examination. This is anathema to the underpinnings of the Confrontation Clause. *Amici*'s experience shows that substitute analysts may be simply unaware of incompetence, negligence, or fraud committed by the actual analyst who performed the testing. In many cases, only a careful and skillful cross-examination of the actual analyst who conducted the flawed test or tests will reveal the truth.

## CONCLUSION

For the foregoing reasons, the National College for DUI Defense asks this Honorable Court to reverse the decision of the Superior Court.

Respectfully submitted,

THE NATIONAL COLLEGE FOR DUI DEFENSE



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## PROOF OF SERVICE

I certify that on this 6th day of November, 2012, I served the required copies of the foregoing Amicus Curiae Brief of The National College For DUI Defense Attorneys in Support of Appellant upon the persons and in the manner indicated below, which service satisfies the requirement of Pa. R.A. P. 121.

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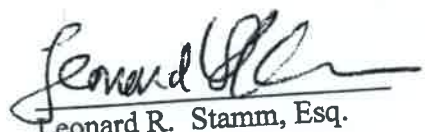

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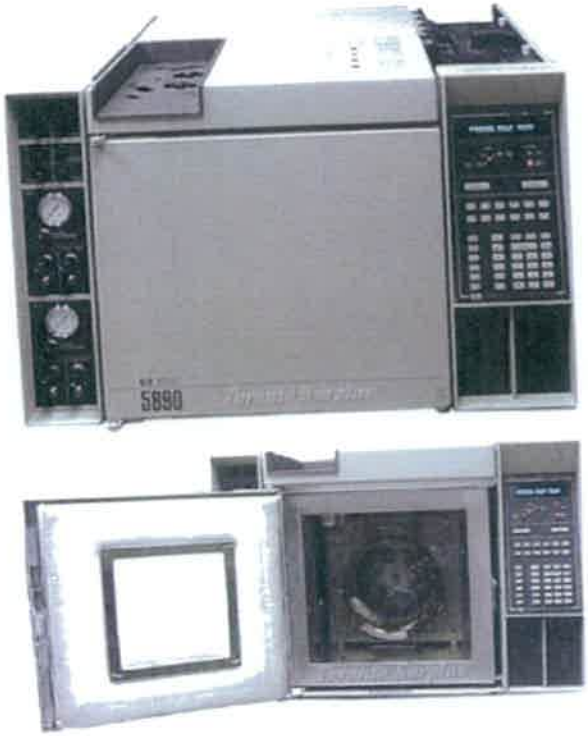
# APPENDIX A

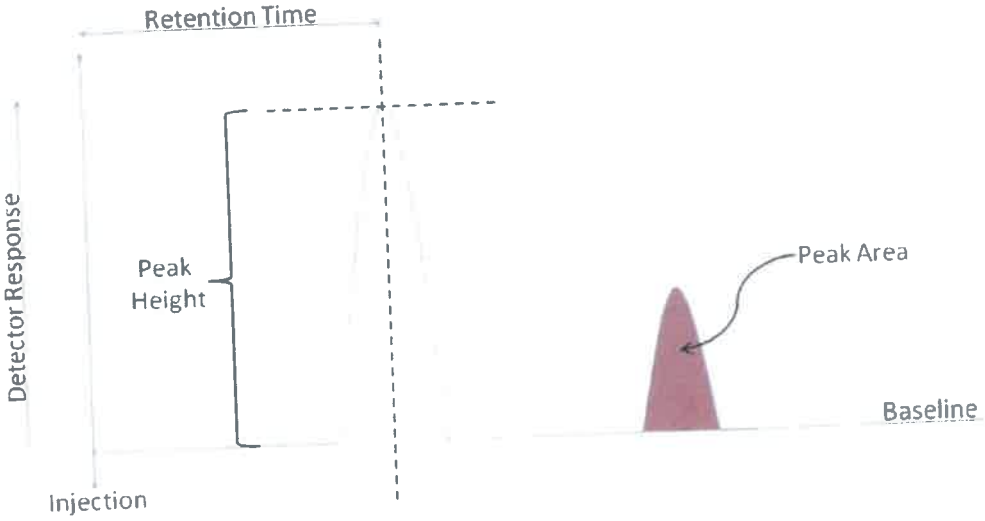



GC MACHINE

LOADED AUTOSAMPLER

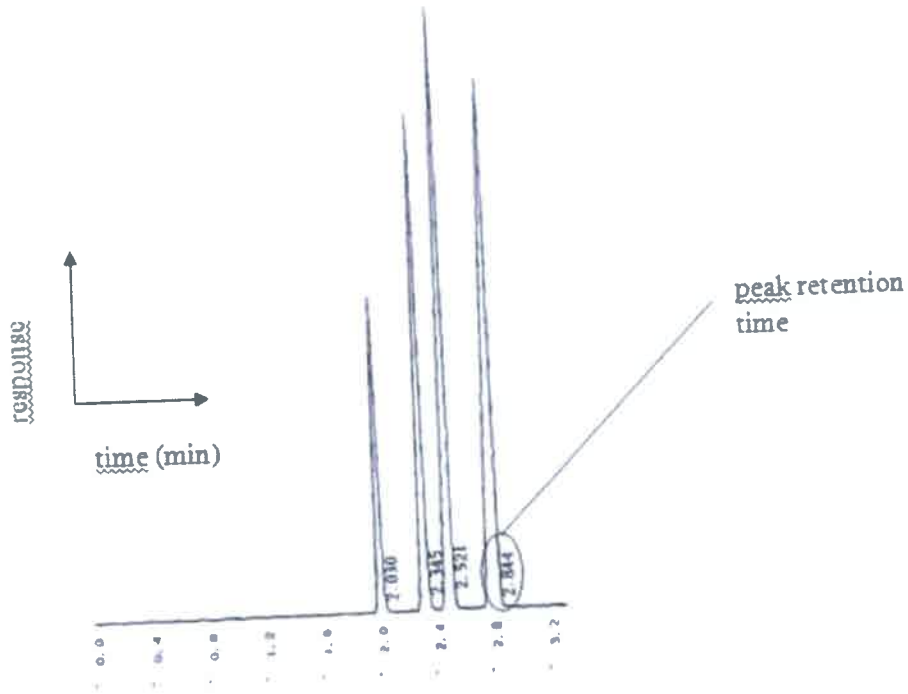
# APPENDIX B

## TYPICAL CHROMATOGRAM



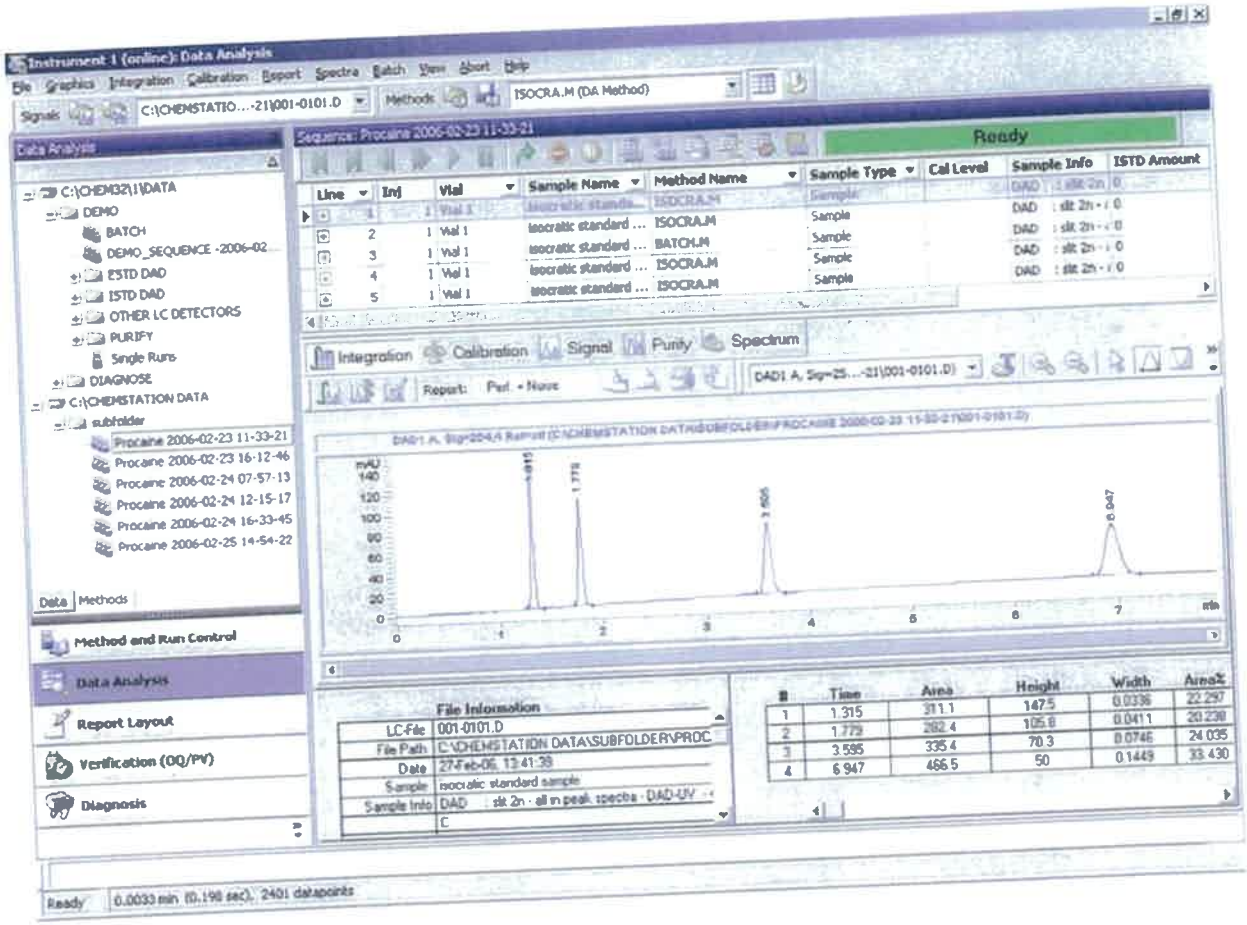



## EXAMPLES OF REAL CHROMATOGRAM



# APPENDIX C

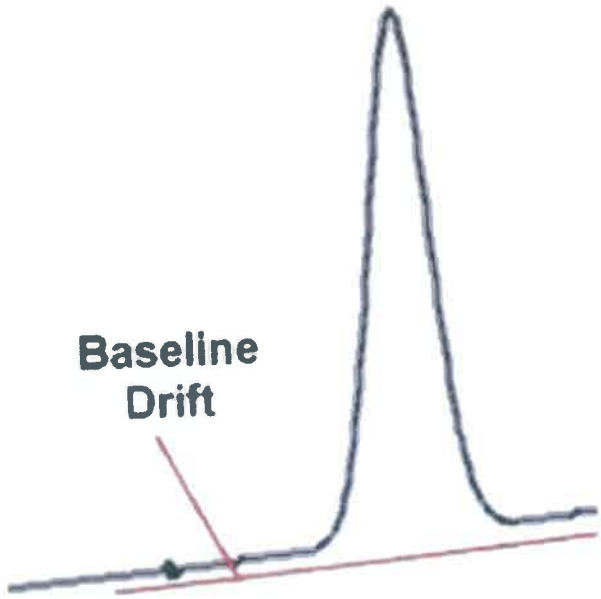
## EXAMPLES OF COMPUTER SCREEN VIEWED BY ANALYST

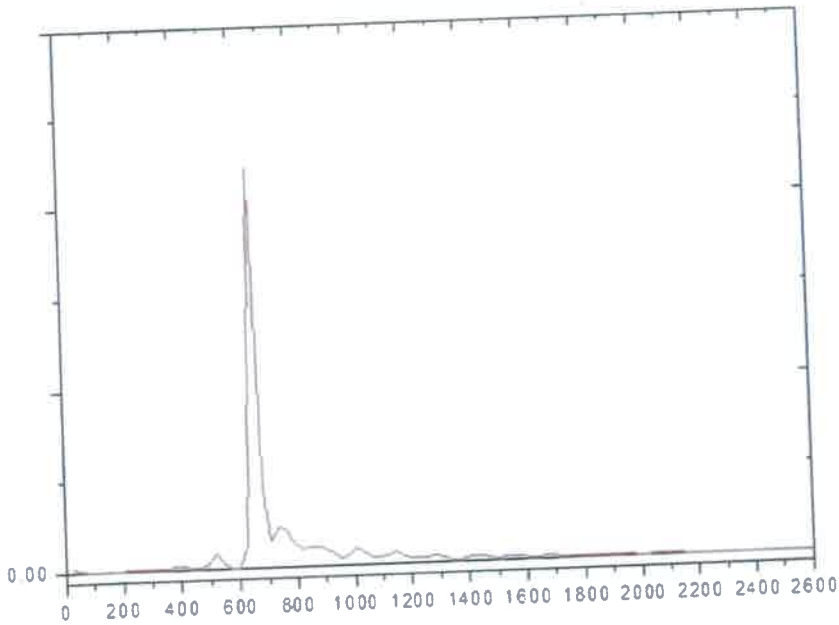



App. 3

# APPENDIX D






EXAMPLE - BASELINE DRIFT

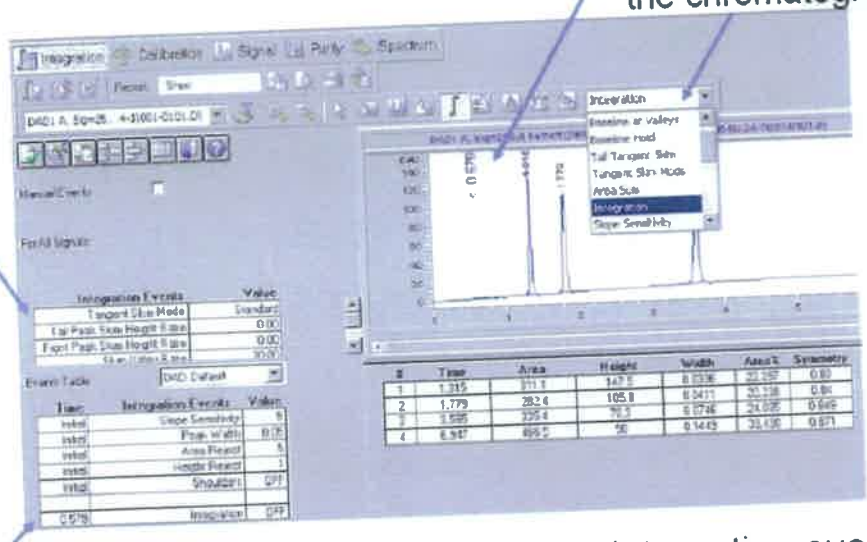
# APPENDIX E



## Integrator UI

Define integration parameters just by selecting and clicking on the chromatogram

Integration events for all signals



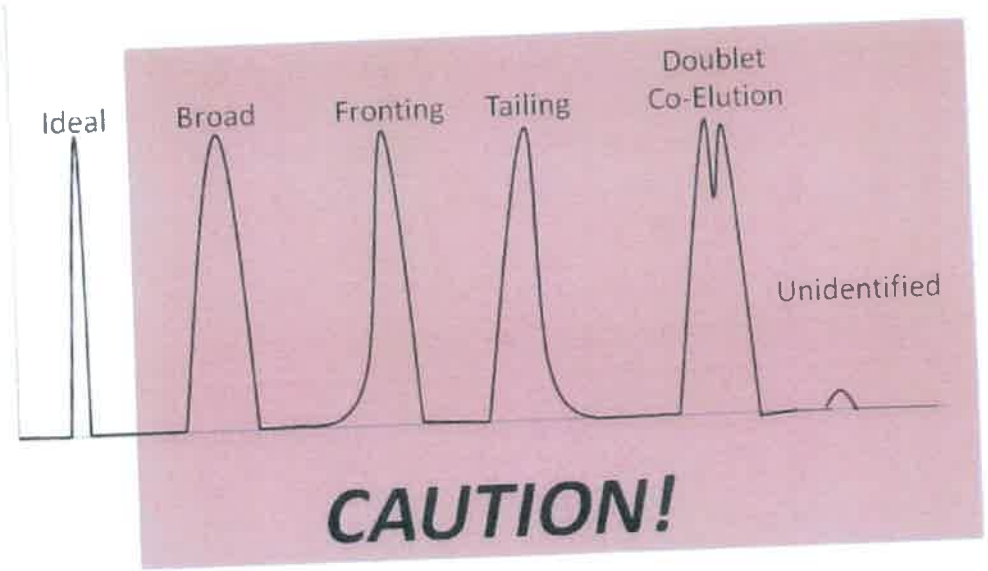
There are two sets of detector specific integration events:

*initial events* and *time-based*

## EXAMPLE OF HOW ANALYST CAN MANIPULATE THE CHROMATOGRAM

## APPENDIX F

# Peak Shapes




App. 6

## PEAK SHAPES THAT AFFECT THE VALIDITY OF THE TEST