



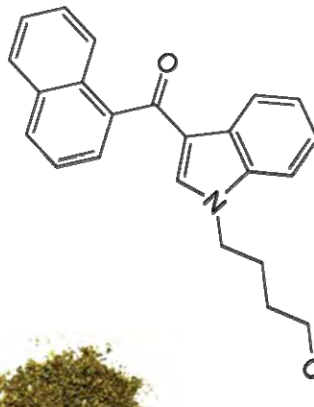
Crime Scene



Spring 2011

Volume 37, Issue 2

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PRESIDENT'S MESSAGE

Spring-2011

Things continue to be very busy for the President and Board. Over the past few months great progress has been made in the organization and planning for the Fall 2011 annual meeting in Tacoma. The site will be at the Hotel Murano in Tacoma, WA in September so please review the data in this issue for the details about workshops, vendors and everything fall meeting.

CERTIFICATION

One opportunity that will be available during the September meeting is the chance to take forensic certification tests. If you've been putting off certification or are new to the field you should make every effort to get ahead of the curve and certify. Current legislation and continued interest from the NAS and other reports will likely make certification REQUIRED in the not too distant future. Certification will strengthen your recognition as an expert to the courts and jurors to whom you testify.

BE AWARE...certification is not automatic nor is it easy! To participate in the NWAFS certification offerings you must pre-register with the certifying body well in advance of the meeting. Look for more information within this issue of *The Scene* or go directly to the web sites:

<http://www.criminalistics.com/>
<http://www.theiai.org/certifications/>

RESEARCH

This year at the NWAFS conference we'll be introducing a new concept for forensic training. Participants will have the opportunity to participate in short, one day research projects that will be presented at the meeting and published in a future issue of NWAFS's publication *Crime Scene*. An experienced mentor will guide a small group of researchers through a project. The researchers must collect data, document the process for future publication/presentation, and commit to completing the project within the time allowed. This is a unique and unprecedented opportunity for forensic practitioners to get a presentation and publication under their belt. Look for more details in this issue and get involved!

Activity Log—President NWAFS

- Approved the setup for on-line payment options through NWAFS.org. Look on our website for soon to be available opportunities to pay your dues on-line or register and pay for the conference on-line!
- Editor consolidated and emailed out over 50 calls for vendors for the fall meeting. This data will be saved and added to for all future meeting sites.
- With the assistance of the technical secretary, recruited numerous workshop instructors and topics for the fall meeting. See this issue for the first announcement of the fall meeting!
- Continued planning for future meeting sites, we need host cities especially for the 2012 (40th year) conference. Please step up if you can host!

Matthew Noedel, President NWAFS
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April 2011

NWAFS NEWSLETTER

Editor's Message

The cover may seem a bit strange for you, but it is a little slice of what is inside this issue. For those that don't know, I have been at home taking care of my daughter, Samantha, for the last 2 months and WOW, that is definitely keeping me busy. It is certainly the hardest job that I have ever taken on but even so, I have also been involved with a lot of things this last quarter in preparation for this issue of the *Crime Scene* newsletter. So, I hope that you enjoy this issue.

You will read the word "excited" and "wow" in this issue of *Crime Scene* and I can't agree more. We not only have another great article from Jeff T. in **Asked & Answered** but we have our first peer reviewed technical article, 2 book reviews, information about the NWAFS fall meeting in Tacoma, updates from TWGs, and more!

It is getting even easier to be part of this great organization by submitting an article, reviewing a book, providing an NWAFS Note or submitting a caption. If you want to do something but just don't have any ideas drop me an email and I will try to assist as best as I can.

Please send me an email to tell me what you think...I'm really serious about this! Your comments can not only improve this newsletter but can help me focus on what you, a member, would want to see in your newsletter. Have a fantastic spring and make sure to keep the 2011 NWAFS Fall meeting in mind.

*Thank you,
Jeff Jagmin*

About the Newsletter...

Crime Scene is the official publication of the Northwest Association of Forensic Scientists. It is published 4 times a year in the months of January, April, July, and October. The Newsletter welcomes submissions from its membership such as technical tips, case studies, literature compilations, workshop or training notifications, reference citations, commentary, historical accounts, and other topics of interest to the membership. The views expressed in articles contained in this publication do not necessarily represent the views of the Northwest Association of Forensic Scientists. The Association neither guarantees, warrants, nor endorses these views or techniques but offers these articles as information to the membership.

Please submit material for publication in Microsoft Word for Windows format as an e-mail attachment or on compact disk (CD). All technical material will be subject to peer review by NWAFS members. Requests for permission of any material contained in this newsletter may be addressed to the editor. Requests, or questions, of technical submissions will be directed to the originating author. For more information regarding the Newsletter contact:

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As per the NWAFS constitution, the *Editorial Secretary shall be the chairperson of the Publications Committee and shall be the Editor of the Association's Newsletter. As such, the Editorial Secretary shall be responsible:*

- (1) *to select no fewer than two (2) Regular, Active Life and/or Associate members to serve on the Publications Committee and assist with the work of the Committee.*
- (2) *to insure:*
 - a) *the Association's Newsletter is published quarterly and is mailed directly to all members of the Association in good standing.*
 - b) *the business of the Association, scientific and other information are reported to the membership in the Newsletter.*
 - c) *in conjunction with the Membership Committee, a directory of the membership shall be printed at least once a year and distributed to the membership of the Association.*
 - d) *other official communications approved by the Board of Directors is published in the Newsletter and distributed to the Membership in a timely manner.*

I am looking for two qualified individuals to serve on the Publications Committee. Some duties of the Publications Committee would be to assist the Editor in assembling the newsletter (reviewing for grammar, punctuation, and helping with content—interesting topics, articles, etc.)

The qualified individuals will be Regular, Active Life, or Associate members with a strong desire to actively participate in the NWAFS and help it grow.

For those interested please contact:
Jeff Jagmin at editor@nwafs.org

Asked & Answered

Search tips from a forensic library

Jeff Teitelbaum, MLIS

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Synthetic Cannabinoids: resource list

Over the past year and a half, there has been a flurry of published information regarding the phenomenon of synthetic cannabinoids. Although they were first synthesized in the 1990s, they have become recently fashionable as a legal alternative to marijuana. Until the recent DEA ban, they have been legally sold over-the-counter and over the internet, generally in small packets of herbal incense with brand names such as **Spice** and **K2**. I thought it might be useful to compile a list of the most oft-cited and credible articles and reports on this subject.

Please find the list below, divided into 4 groups:

- 1) **Early/Foundational journal articles** (many of these are articles written by Dr. John W. Huffman, the Clemson University chemist who first synthesized and named JWH-018)
- 2) **Current journal articles**
- 3) **Reports and websites**. Hyperlinks are provided whenever possible
- 4) **Mass Spectral databases**

Early/Foundational articles

Huffman, J. W., D. Dai, et al. (1994). "Design, synthesis and pharmacology of cannabimimetic indoles." Bioorganic & Medicinal Chemistry Letters **4**(4): 563-566.

Huffman, J.W. (1996) "Synthesis and pharmacology of a very potent cannabinoid lacking a phenolic hydroxyl with high affinity for the CB2 receptor." Journal of Medical Chemistry **39**(20): 3875-3877.

Huffman, J.W., Duncan, S. Jr. (1997). "Synthesis and pharmacology of the 1',2'-dimethylheptyl-delta8-thc isomers: exceptionally potent cannabinoids." Bioorganic & Medicinal Chemistry Letters **7**(21): 2799-2804

Lainton, J. A. H., J. W. Huffman, et al. (1995). "1-Alkyl-3-(1-Naphthoyl)Pyrroles – A new class of cannabinoid." Tetrahedron Letters **36**(9): 1401-1404.

Weissman A., Milne G.M., et al. (1982) "Cannabimimetic activity from CP-47,497, a derivative of 3-phenylcyclohexanol." J Pharmacol Exp Ther **223**(2):516-23.

Wiley, J., Compton, D., Huffman, J., et al. (1998) "Structure-Activity Relationships of Indole- and Pyrrole-Derived Cannabinoids." The Journal of Pharmacology and Experimental Therapeutics **285** (3): 995-1004

Current articles

Atwood, B., Huffman, J., et al. (2010). "JWH018, a common constituent of 'Spice' herbal blends, is a potent and efficacious cannabinoid CB1 receptor agonist." British Journal of Pharmacology, **160**(3), 585–593.

Auwärter, V., S. Dresen, et al. (2009). "'Spice' and other herbal blends: harmless incense or cannabinoid designer drugs?" Journal of Mass Spectrometry : JMS **44**(5): 832-837.

Brandt, S. D., H. R. Sumnall, et al. (2010). "Analyses of second-generation 'legal highs' in the UK: initial findings." Drug Testing and Analysis **2**(8): 377-382.

Combs, M., Morris, J. (2010) "Analytical Profile of Two Synthetic Cannabinoids – JWH–018 and JWH–073." Journal of the Clandestine Laboratory Investigating Chemists, **20**(2); 2-7.

Dowling, G. and L. Regan (2011). "A method for CP 47, 497 a synthetic non-traditional cannabinoid in human urine using liquid chromatography tandem mass spectrometry." Journal of Chromatography B, Analytical Technologies in the Biomedical and Life Sciences **879**(3-4): 253-259.

Dresen, S., N. Ferreiros, et al. (2010). "Monitoring of herbal mixtures potentially containing synthetic cannabinoids as psychoactive compounds." Journal of Mass Spectrometry **45**(10): 1186-1194.

Dresen, S., S. Kneisel, et al. (2011). "Development and validation of a liquid chromatography-tandem mass spectrometry method for the quantitation of synthetic cannabinoids of the aminoalkylindole type and methanandamide in serum and its application to forensic samples." Journal of Mass Spectrometry **46**(2): 163-171.

Emanuel, C. E. J., B. Ellison, et al. (2010). "Spice up your life: screening the illegal components of 'Spice' herbal products." Analytical Methods **2**(6): 614-616.

Gibbons, S. and M. Zloh (2010). "An analysis of the 'legal high' mephedrone." Bioorganic & Medicinal Chemistry Letters **20**(14): 4135-4139.

Hudson, S., Ramsey, J., et al. (2010). "Use of high-resolution accurate mass spectrometry to detect reported and previously unreported cannabinomimetics in "herbal high" products." Journal of Analytical Toxicology, **34**(5):252-60.

Hudson, S., Ramsey, J. (2011). "The emergence and analysis of synthetic cannabinoids." Drug Testing and Analysis Epub ahead of print

Huffman, J. W., J. Z. Lu, et al. (2000). "Synthesis and pharmacology of a hybrid cannabinoid." Bioorganic & Medicinal Chemistry **8**(2): 439-447.

Huffman, J. W., R. Mabon, et al. (2003). "3-indolyl-1-naphthylmethanes: new cannabimimetic indoles provide evidence for aromatic stacking interactions with the CB1 cannabinoid receptor." Bioorganic & Medicinal Chemistry **11**(4): 539-549.

Huffman, J. W., P. V. Szklennik, et al. (2005). "1-Pentyl-3-phenylacetylindoles, a new class of cannabimimetic indoles." Bioorganic & Medicinal Chemistry Letters **15**(18): 4110-4113.

Huffman, J. W., G. Zengin, et al. (2005). "Structure-activity relationships for 1-alkyl-3-(1-naphthoyl) indoles at the cannabinoid CB(1) and CB(2) receptors: steric and electronic effects of naphthoyl substituents. New highly selective CB(2) receptor agonists." Bioorganic & Medicinal Chemistry **13**(1): 89-112.

Huffman, J. W., A. L. Thompson, et al. (2008). "Synthesis and pharmacology of 1-deoxy analogs of CP-47,497 and CP-55,940." Bioorganic & Medicinal Chemistry **16**(1): 322-335.

Huffman, J. W., S. A. Hepburn, et al. (2010). "Synthesis and pharmacology of 1-methoxy analogs of CP-47,497." Bioorganic & Medicinal Chemistry **18**(15): 5475-5482.

Lindigkeit, R., A. Boehme, et al. (2009). "Spice: a never ending story?" Forensic Science International **191**(1-3): 58-63.

Möller, I., A. Wintermeyer, et al. (2010). "Screening for the synthetic cannabinoid JWH-018 and its major metabolites in human doping controls." Drug Testing and Analysis. Epub ahead of print.

Nakajima, J., Takahashi, M., et al. (2010). "Identification and quantitation of cannabimimetic compound JWH-250 as an adulterant in products obtained via the Internet." Forensic Toxicology **29**(1): 51-55.

Neukmann, M.A., Mürdter, T., et al. (2009) "Quantitative detection of the active "spice" ingredient JWH-018 in serum by means of liquid chromatography-tandem mass Spectrometry." Blutalkohol; **46**; 373-379.

Ottani, A., Giuliani, D. (2001) "HU 210: A potent tool for investigations of the cannabinoid system." CNS Drug Reviews; **7**(2): 131-145.

- Piggee, C. (2009). "Investigating a not-so-natural high." Analytical Chemistry **81**(9): 3205-3207.
- Schmidt, M. M., A. Sharma, et al. (2010). ""Legal highs" on the net - evaluation of UK-based websites, products and product information." Forensic Science International. Article in Press.
- Schneir, A. B., J. Cullen, et al. (2010). ""Spice" girls: synthetic cannabinoid intoxication." The Journal of Emergency Medicine. Epub ahead of print.
- Sobolevsky, T., I. Prasolov, et al. (2010). "Detection of JWH-018 metabolites in smoking mixture post-administration urine." Forensic Science International **200**(1-3): 141-147.
- Teske, J., Weller, J-P., et al. (2010) "Sensitive and rapid quantification of the cannabinoid receptor agonist naphthalen-1-yl-(1-pentylindol-3-yl)methanone (JWH-018) in human serum by liquid chromatography–tandem mass spectrometry." Journal of Chromatography B. Article in press.
- Uchiyama, N., R. Kikura-Hanajiri, et al. (2009). "Identification of a cannabimimetic indole as a designer drug in a herbal product." Forensic Toxicology **27**(2): 61-66.
- Uchiyama, N., Kikura-Hanajiri, R., et al. (2009). "Identification of a cannabinoid analog as a new type of designer drug in a herbal product." Chem. Pharm. Bull. **57**(4) 439–441.
- Uchiyama, N., Kikura-Hanajiri, R., et al. (2010). "Chemical analysis of synthetic cannabinoids as designer drugs in herbal products." Forensic Science International **198**; 31–38.
- Uchiyama, N., M. Kawamura, et al. (2010). "Identification and quantitation of two cannabimimetic phenylacetylindoles JWH-251 and JWH-250, and four cannabimimetic naphthoylindoles JWH-081, JWH-015, JWH-200, and JWH-073 as designer drugs in illegal products." Forensic Toxicology **29**(1): 25-37.
- Vardakou, I., Pistos, C., Spiliopoulou, C. (2010). "Spice drugs as a new trend: mode of action, identification and legislation." Toxicology Letters **197**(3); 157-62.
- Wintermeyer, A., Möller, I., et al. (2010) "In vitro phase I metabolism of the synthetic cannabimimetic JWH-018." Analytical and Bioanalytical Chemistry **398**;2141–2153

Reports and websites

Advisory Council on the Misuse of Drugs

July 16, 2009 - An independent expert body that advises the British government on drug related issues in the UK, they issued a report with their recommendations for dealing with the new synthetic cannabinoids that were just hitting the market. The report was considered by many to be a more balanced response to the synthetics than was the response by the DEA.

Their report, **Consideration of the Major Cannabinoids Agonists**, can be found at <http://webarchive.nationalarchives.gov.uk/+http://www.homeoffice.gov.uk/publications/drugs/acmd1/acmd-report-agonists?view=Binary>.

DEA Moves to Emergency Control Synthetic Marijuana

November 24, 2010 – please find the DEA’s announcement at <http://www.justice.gov/dea/pubs/pressrel/pr112410.html>.

DEA - Temporary Placement of Five Synthetic Cannabinoids into Schedule I

Federal Register, March 1, 2011 – please find the Final Order at <http://www.gpo.gov/fdsys/pkg/FR-2011-03-01/pdf/2011-4428.pdf>.

The EMCDDA (European Monitoring Centre for Drugs and Drug Addiction)

This organization was established in 1993 to provide the EU and its Member States with a factual overview of European drug problems and a solid evidence base to support the drugs debate.

In 2009, the EMCDDA issued a report titled **Understanding the “Spice” phenomenon**. This report is still considered by many to be one of the most useful documents about the new synthetic cannabinoids. The report can be found at http://www.emcdda.europa.eu/attachements.cfm/att_80086_EN_Spice%20Thematic%20paper%20—%20final%20version.pdf.

The EMCDDA website also has an updated section about [synthetic cannabinoids](#) and can be found at <http://www.emcdda.europa.eu/publications/drug-profiles/synthetic-cannabinoids>.

National Alliance for Model State Drug Laws

The NAMSDL is ‘a resource for governors, state legislators, attorneys general, drug and alcohol professionals, community leaders, the recovering community, and others striving for comprehensive and effective state drug and alcohol laws, policies, and programs.’

The NAMSDL has a nice compilation of state bills and statutes related to synthetic cannabinoids. <http://www.namsdl.org/SyntheticSubstancesReportsandResearch.htm>

Reports on synthetic substances can be found at <http://www.namsdl.org/SyntheticSubstancesReportsandResearch.htm>

Of particular interest are the following reports:

Synthetic cannabinoids – state bills, statutes and regulations – find the report at <http://www.namsdl.org/documents/SyntheticCannabinoidLegislationMemorandum3.4.2011.pdf>

Synthetic Cannabinoids - State Legislative Update - find the report at <http://www.namsdl.org/documents/SyntheticCannabinoidLegislationMemorandum3.4.2011.pdf>

National Conference of State Legislatures

The NCSL is 'a bipartisan organization that serves the legislators and staffs of the nation's 50 states, its commonwealths and territories. NCSL provides research, technical assistance and opportunities for policymakers to exchange ideas on the most pressing state issues.'

The NCSL compiles lists of state laws that pertain to synthetic cannabinoids. (home page is at <http://www.ncsl.org/Default.aspx?TabID=756&tabs=951,62,94#951>)

Wikipedia

As always, material found on Wikipedia should be corroborated with other sources, but their posting on synthetic cannabis (and related compounds such as JWH-018, HU-210, etc.) is worth a look. One nice segment to this article is a rundown of the legal status of these synthetic cannabinoids in various countries around the world.

Please find their article on "synthetic cannabis" at http://en.wikipedia.org/wiki/Synthetic_cannabis#cite_note-33

Mass Spectral Databases

ForensicDB

RTI International launched a new database library to aid in searching for spectral information. Approximately 2,500 records are currently in the database, much of them culled from the AAFS (American Academy of Forensic Sciences) mass spec database.

From the ForensicDB home page introduction: *Forensicdb.org is a publicly available cheminformatics data library providing the ability to search a given spectra against a Web-accessible database of reviewed spectra and have spectra from multiple spectral methods available in the same database. The database seeks to include FTIR, EI-MS and accurate mass data on compounds of forensic interest. Users can search the database from the Web without any other software and users are also encouraged to strengthen the database by contributing spectral data.*

Please find the database at <https://www.forensicdb.org/index.htm>

SWGDRUG Mass spectral library

SWGDRUG (Scientific Working Group for the Analysis of Seized Drugs) has released a searchable mass spectral library which, by several accounts, is very robust and very useful, particularly with the various incarnations of the newer synthetic cannabinoids. There are currently 1371 spectra in the library, and there will be updates on a regular basis.

From the SWGDRUG website: *SWGDRUG has compiled a mass spectral library from a variety of sources, containing drugs and drug-related compounds. All spectra were collected using electron impact mass spectrometry systems. This library is available for download from this website. Although SWGDRUG makes an effort to review the accuracy of spectra prior to entry, this library should only be used as an analytical tool. SWGDRUG recommends the use of traceable reference materials to support identifications of drugs.*

Please find the database at <http://www.swgdrug.org/ms.htm>

The field of synthetic cannabinoids is rapidly changing and it is vital that scientists remain abreast of new research. There are already hundreds of variations to the 5 compounds that the DEA recently banned, and manufacturers simply drop down to the next drug on the list in their efforts to avoid legal ramifications. Hopefully this list will prove useful; please look for an updated list of synthetic cannabinoids resources in a future column.

Jeff Teitelbaum

March 14, 2011

Jeff.Teitelbaum@wsp.wa.gov



***Make sure to check out
the Synthetic THC Roundtable at
the 2011 NWAFFS Fall Meeting!***



The Portland Chapter of the American Chemical Society is hosting a Northwest Regional ACS conference, NORM 2011. It will be held in Portland, Oregon June 26-29 at the Red Lion on the River. Abstract submission and registration information can be found at www.norm2011.org.

Along with this conference, the American Chemical Society was kind enough to sponsor a no-cost presentation for all NWAFC members and local law enforcement officers. The speaker for this presentation is Jason Nawyn, Forensic Chemist, from the US Army Criminal Investigation Laboratory (USACIL), located at Fort Gillem, Georgia. The topic is:

“SYNTHETIC CANNABINOIDS”

Over the past few years we’ve seen a sudden rise in the “legal highs” that are available. From the synthetic cannabinoids of the Spice craze to the bath salts containing MDPV, it seems that there are more and more ingenious ways to get high while skirting some common drug laws. This course will focus mainly on the synthetic cannabinoids and the drug analogs (methyldone, mephedrone, etc). We will discuss their history, chemistry, legal issues, common objections, and delve into what compounds are likely to be next.

A No Host Dinner with Jason Nawyn will follow the presentation.

THIS TRAINING IS FREE
BUT ONE MUST FIRST RSVP AS SEATING IS LIMITED!

Monday, June 27th at 3:00

Please Contact Tom Barnes
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A JOB WELL DONE!

I am pleased to present to our membership
the first peer reviewed article in *Crime Scene* :
Review: Synthetic Methods for Amphetamine
Andrew Allen and Roger Ely

At the 2010 NWAFS business meeting in Portland it was voted that the association would have all technical articles which are submitted to the *Crime Scene* newsletter peer reviewed by members of our association. With a little bit of time and a lot of hard work by the authors and peer reviewer this goal has been reached.

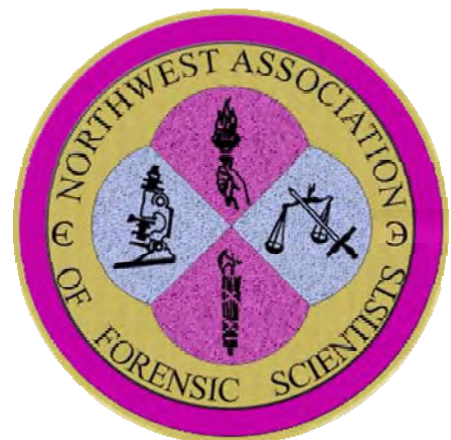
A brief overview of how this process was carried out with the first article is as follows. When this article was first received by me, I redacted all of the authors information. I then sent this version along with a peer review checklist to a scientist within our NWAFS membership that had previously offered assistance to review articles. I received input back from the peer reviewer and sent this information back to the authors. The authors reviewed the comments, agreed with them, and willingly made the suggested changes/comments.

I want to thank the authors for not only their submission of this first article but also their patience in this process. I would also like to thank the peer reviewer for his/her willingness to take on this first review. This is a big first step for our organization, and I am very pleased with the outcome. With this peer review not only do the authors have a better product but the newsletter has a great submission to provide to our membership. Once again, congratulations for all of those involved...great job!

For those that want to have a technical article published in the *Crime Scene* newsletter please submit to:

Jeff Jagmin - NWAFS Editor

editor@nwafs.org



*Review: Synthetic Methods for Amphetamine*A. Allen¹ and R. Ely²¹Array BioPharma Inc., Boulder, Colorado 80503²Drug Enforcement Administration, San Francisco, CA**Abstract:**

This review focuses on synthesis of amphetamine. The chemistry of these methods will be discussed, referenced and precursors highlighted. This review covers the period 1985 to 2009 with emphasis on stereoselective synthesis, classical non-chiral synthesis and bio-enzymatic reactions. The review is directed to the Forensic Community and thus highlights precursors, reagents, stereochemistry, type and name reactions. The article attempts to present, as best as possible, a list of references covering amphetamine synthesis from 1900 -2009. Although this is the same fundamental ground as the recent publication by K. Norman; "Clandestine Laboratory Investigating Chemist Association" 19, 3(2009)2-39, this current review offers another perspective.

Keywords: Review, Stereoselective, Amphetamine, Syntheses, references,

Introduction:

It has been 20 years since our last review of the synthetic literature for the manufacture of amphetamine and methamphetamine. Much has changed in the world of organic transformation in this time period. Chiral (stereoselective) synthetic reactions have moved to the forefront of organic transformations and these stereoselective reactions, as well as regio-reactions and biotransformations will be the focus of this review. Within the synthesis of amphetamine, these stereoselective transformations have taken the form of organometallic reactions, enzymatic reactions, ring openings, α -aminooxylations, alkylations and amination reactions. The earlier review (*J. Forensic Sci. Int.* 42(1989)183-189) addressed for the most part, the "reductive" synthetic methods leading to this drug of abuse. It could be said that the earlier review dealt with "classical organic transformations," roughly covering the period from 1900-1985. This time-line is graphically illustrated below in Figure 1. As illustrated in this figure, certain categories have been historically active. Early synthetic organic transformations such as aldol condensations, the Hofmann rearrangement [105, 116], the Curtius rearrangement [118, 110, 80], the Schmidt rearrangement [80], the Lossen rearrangement [118], the Beckmann rearrangement [111], the Wolff rearrangement [109], the Friedel-Craft alkylation [102, 105] together with catalytic reductions; populated the literature from 1900-1985. Of course, overlap has occurred between these categories as the field of organic chemistry has progressed.

Interestingly, organic synthetic transformations have entered, in the last 20 years, a period of "stereoselective organic transformation". This is graphically illustrated in Figure 1a. The multiplicity of these transformations and their unique starting precursors and reagents may come as a challenge to the forensic community to keep up with the latest organic modifications and "off-precursor-watch-list" circumventions. Herein, we hope to summarize as exhaustively as possible, the chemistry pictorially and compose a list of precursor chemicals (IUPAC nomenclature, *see supplemental material*) that address these transformations to amphetamine.

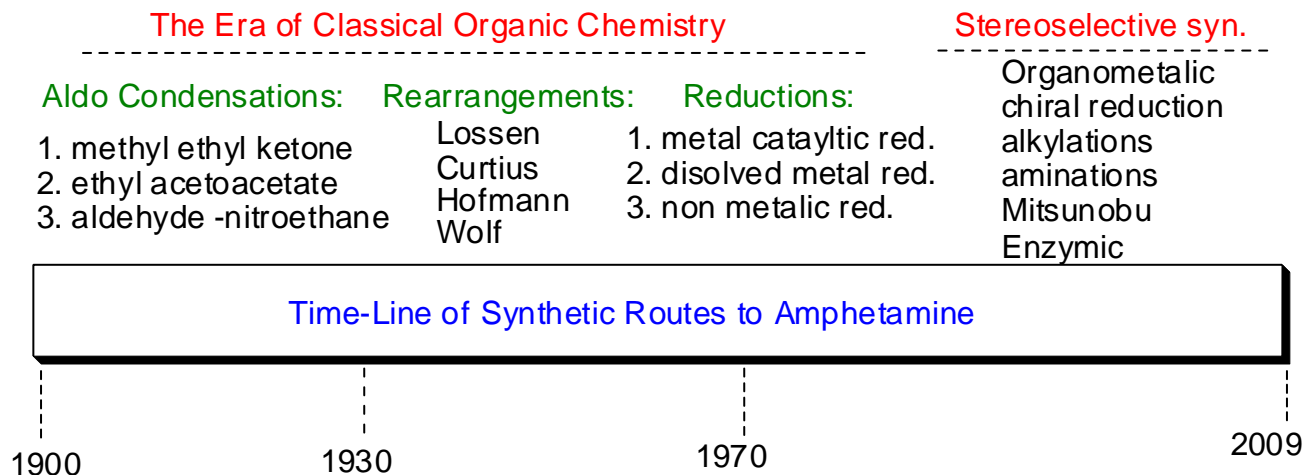


Figure 1

As best as possible, we have attempted to keep the needs of the forensic chemist and law enforcement personnel in mind when creating the categories for retrieving the information on a particular synthetic route. This has added a degree of difficulty to our task since in many cases, the chemist thinks visually (synthetic routes) and the law enforcement investigator works texturally (list of precursors). The categories of this review are listed below and are not without their limitations.

Outline:

- Review of amphetamine syntheses **1985 – 2009** (*Schema 2, 3, 4*)
 - Stereoselective syntheses (*Schema 2*)
 - Non-Chiral Syntheses (*Schema 3*)
 - Biotransformation (*Schema 4*)
- Review of classical amphetamine syntheses **1900 – 1985** (*Schema 5 and 6*)
 - Classical Organic Transformations (*Schema 5*)
 - Summary Routes to Amphetamine (*Schema 6*)

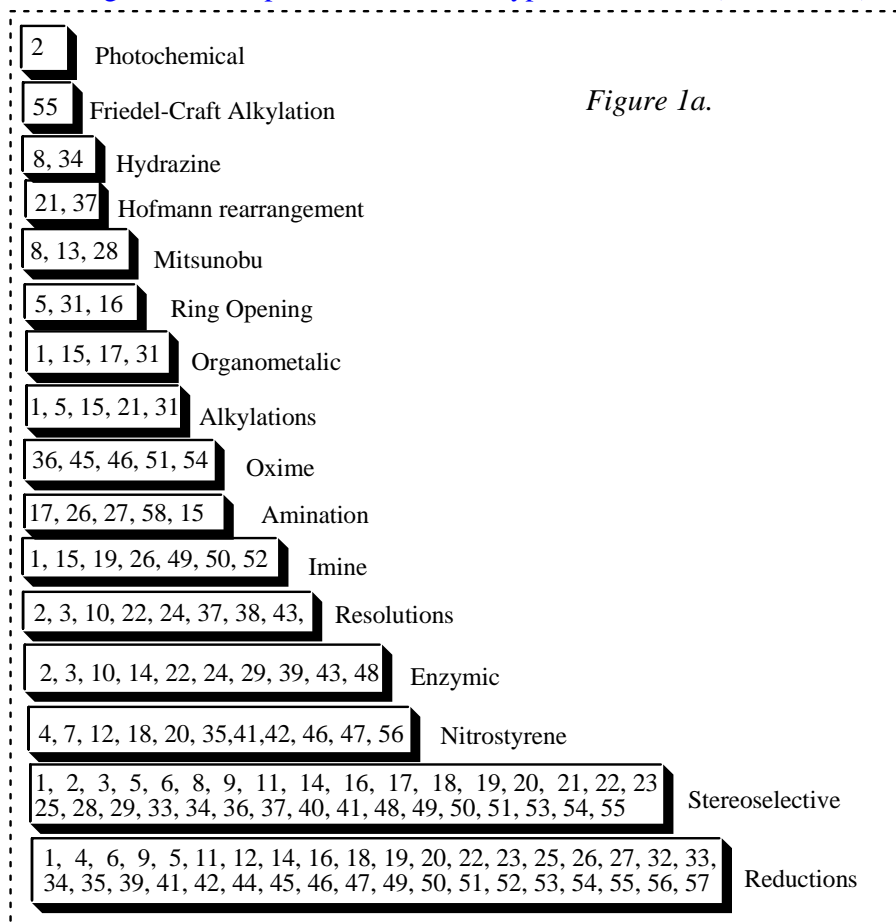
Overview:

In this reviewing period (1985-2009), with progress in stereoselective syntheses and organometallic transformations, academia, along with private industry have been motivated to explore new approaches to the synthesis of amphetamine. These numerous publications have undoubtedly been prompted more by the introduction of a chiral center alpha to a primary amine than the desire to add yet another synthetic approach to the multitude of synthetic routes to amphetamine.

Organometallic chemistry has been used in creative region-constructions of amphetamine, not only with magnesium metal [21, 15], but also with cerium [49], titanium [26], iridium [1] and lithium [1]. Similarly, in the area of organometallic reductions to amphetamine, the field of reagents has expanded to include samarium iodide [4, 6, 9], ruthenium-(chiral-ligands) [18, 20, 36, 41], rhodium-(chiral ligands) [51], titanium-ligands [26], copper [32, 17], magnesium [32] and novelties with borane [33, 42, 56], lithium aluminum hydride [12, 35, 47], L-Selectride [25], Red-Al® [46], palladium [11, 14, 16, 23, 27, 40, 50, 53] and Raney nickel [33, 49 50]. Creative

synthetic routes that do not employ a reductive step have also been published [15, 17, 21, 28, 31, 37, 55, 58]. Ring opening strategies have been developed against phosphorylated aziridines [31] and Sharpless epoxides [5] to yield amphetamine. Mitsunobu transformations [5, 8, 14, 19, 34] have been exploited in a variety of approaches to swap an alcohol precursor to the amine complement toward amphetamine. Hofmann, Curtius [37, 80], Lossen[37] and Schmidt rearrangement [80] continue to be used in synthetic schemes to produce amphetamine. The “classical” Friedel-Craft alkylation [105] of benzene with iron or aluminum trichloride has been improved with the use of *N*-(trifluoroacetyl)- α -amino acid chloride as a chiral F-C reagent to manufacture amphetamine [55]. Intermediates of nitrostyrene have been reduced chirally and non-chirally to amphetamine [4, 12, 18, 20, 35, 41, 42, 56]. Likewise, hydroxylamine via chiral hydrosilylation [51] and hydrazines [8, 52] have been exploited in routes to amphetamine. Reductive aminations via phenyl-2-propanone; P-2-P [19, 40, 51, 54] have appeared in these years, as well as other creative approaches like α -amination [5], alkyne-amination [26], alkene-amination [27], α -aminooxylation [5], electrophilic aminations [15], and sulfinyl-imine amination [17]. Photochemical-induced racemization has been utilized for the transformation of the less pharmacologically active *R* isomer to an equilibrium mix of *R,S*-amphetamine [2]. Improved resolution from racemic mixture of amphetamine to a single isomer has been achieved with “enzymatic transformations” [3, 10, 22, 24, 43] and “classical organic salts resolutions” [37, 47]. Illustrated in Figure 1a and 1b are the histograms and citations for some of the active categories within the transformations to amphetamine between 1985-2009. The activities of stereoselectivity, resolutions and enzymatic transformations are expressly evident.

Histograms for amphetamine reaction types 1985-2009 (#-reference)



Literature Citations for the Synthesis of Amphetamine 1985-2009

Enzymatic (Bio Transformations)

(see Scheme 4)

2. *J. Org. Chem.*, JOC 73(2008)364
3. *J. Org. Chem.*, JOC 72(2007)6918
10. *Indian J. Chem. Soc. B.*, IJCS 44B(2005)1312
14. *J. Chemical Research*, JCR 10(2004)681
22. *Tetrahedron Asymmetry*, TA 13(2002)1315
24. *Synthetic Comm.*, SC 31(2001)569
39. *Chem. & Pharm. Bull.*, CPB 38(1990)3449
43. US Patent 04950606B1 (1990)

Non-Chiral Organic Synthesis

(see Scheme 3)

4. *Tetrahedron Letter*, TL 48(2007)5707
12. *J. Organic Chem.*, JOC 70(2005)5519
13. *Organic & Biomol. Chem.*, OBC 3(2005)1049
15. *Organic Letters*, OL 6(2004)4619
26. *Organic Letters*, OL 2(2000)1935
27. *Tetrahedron, Tetra.* 56(2000)5157
31. *Tetrahedron, Tetra.* 53(1997)4935
32. *J. Chem. Soc. Perkin I*, JCSP1 1(1996)265
37. *J. Labeled Comp. Rad.*, JLCR 31(1992)891
38. *J. Medicinal Chem.*, JMC 34(1991)1094
40. *J. Chromatographic Sci.*, JCS 28(1990)529
41. *Tetrahedron, Tetra* 46(1990)7403
42. *Tetrahedron, Tetra* 46(1990)7743
45. *Coll. Czech. Chem. Comm.*, 54(1989)1995
48. *Organic Reactions*, Vol 36 (book, 1988)
57. *J. Medicinal Chem.*, JMC 31(1988)1558
52. *J. Chem. Soc. Chem. Comm.* 2(1986)176
54. *Khimya Geter. Soed* #12,1648(1985)
56. *Synthetic Comm.*, SC 15(1985)843
22. *Tetrahedron Asymmetry*, TA 13(2002)1315

Stereoselective Synthesis

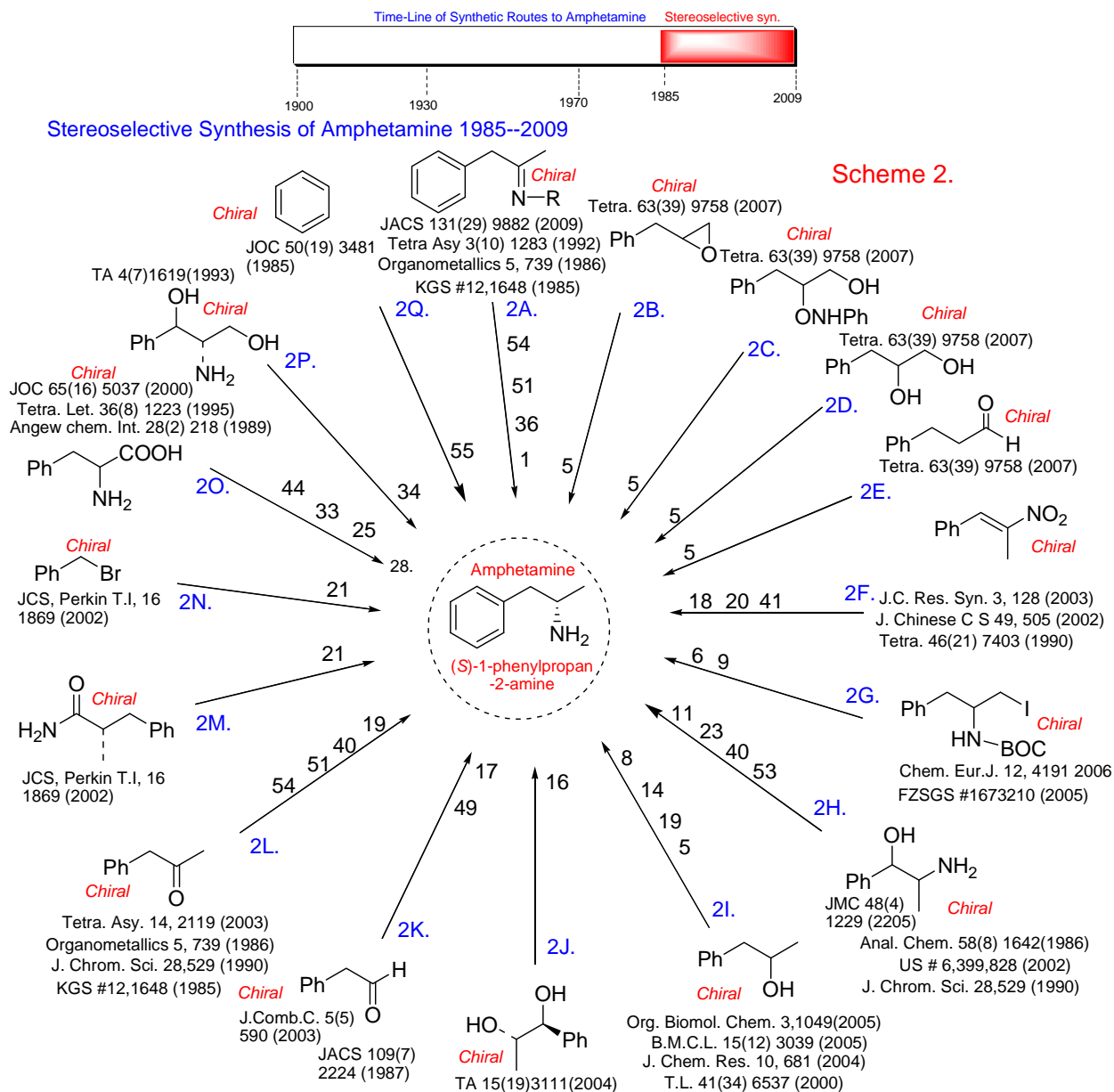
(see Scheme 2)

1. *J. American Chem. Soc. JACS* 131(2007)9882
5. *Tetrahedron, Tetra.* 63(2007)9758
6. *Chemistry A European J.*, JEC 12(2006)4197
8. *Biological Med. Chem. Letter*, BMCL 15(2005)3039
9. FZSGS patent # 1673210 (2005)
11. *J. Medicinal Chem.*, JMC 48(2005)1229
14. *J. Chem. Research*, JCR 10(2004)681
16. *Tetrahedron Asymmetry*, TA 15(2004)3111
17. *J. Combinatorial Chem.* 5(2003)590
18. *J. Chem. Research*, JCR 3(2003)128
19. *Tetrahedron Asymmetry*, TA 14(2003)2119
20. *J. Chinese Chem. Soc.* 49(2002)505
21. *J. Chem. Soc. Perkin I*, JCSP1 16(2002)1869
22. *Tetrahedron Asymmetry*, TA 13(2002)1315
23. US patent #6399828(2002)
25. *J. Organic Chem.*, JOC 65(2000)5037
28. *Tetrahedron Letters*, TL 41(2000)6537
33. *Tetrahedron Letters*, TL 36(1995)1223
34. *Tetrahedron Asymmetry*, TA 4(1993)1619
36. *Tetrahedron Asymmetry*, TA 3(1992)1283
37. *Acta. Chimica Scan.* 45(1991)431
41. *Tetrahedron, Tetra* 46(1990)7403
44. *Angew Chem. Int.* 28(1989)218
49. *J. American Chem. Soc. JACS* 109(1987)2224
51. *Organometallics*, 5(1986)739
53. *Analytical Chem.* 58(1986)1642
54. *Khimya Geter. Soed.* 12(1985)1648
55. *J. Organic Chem.*, JOC 50(1985)3481

= Reference

Figure 1b.

Amphetamine Review (1989 – 2009)



Discussion of Stereoselective Syntheses of Amphetamine 1985-2009:

Illustrated in Scheme 2, routes 2A-2Q, represent the multitude of stereoselective approaches to amphetamine published between 1985 –2009. Within this illustrated pinwheel of reaction routes, we have arranged references in reverse chronological order –clockwise [#’s]. As a starting point for discussion, take the Schiff base (1-phenylpropan-2-imine, route 2A) as a chiral approach to amphetamine [1, 36, 51, 54]. This approach has been facilitated by the improvements of chiral organometallic ligands with transition metals in order to effect chiral catalytic reductions [1, 36, 51, 54, route 2A]. Similarly, armed with chiral organometallic ligands with ruthenium and rhodium, the reduction of nitrostyrenes [(*E*)-(2-nitroprop-1-enyl)benzene] have been achieved stereoselectively [18, 20, 41; route 2F].

A completely different approach was taken by Talluri, S. et. al.; [routes 2B-E], wherein they initiated the route to amphetamine from 1-phenylpropanal [5, route 2E]. Starting from this one-carbon extended aldehyde as opposed to the typical 2-phenylacetaldehyde [17, 49; route 2K] or benzaldehyde [47, 80, 89, 92, 95, 110; route 5Z, also implicit in 18, 20, 41, 42, 44, 56, 60, 39, 54, 61, 35, 22, 20, 18, 12, 4.57, 85, 84, 75, 74, 70, 67, 62, 94, 87, 86, 113, 114; route 5A] precursor, these workers performed a chiral oxy-alkylation with nitrosobenzene to (*R*)-3-phenylpropan-1,2-diol [5, route 2C-2D]. Tosyl chloride assisted ring closure lead to the epoxide, 2-benzyloxirane [5, route 2B]. Reductive ring opening of the epoxide produced the alcohol, (*S*)-1-phenylpropan-2-ol; [see structure in route 2I]. This was followed by swapping the alcohol moiety for azide. The final step was catalytic (PtO₂) reduction to amphetamine [5]. Although a lengthy process to amphetamine, its potential importance to forensic chemists lies in the fact that each intermediate is a potential starting precursor for a chiral synthesis to amphetamine. Closely allied to the alcohol-azide swap in the previous route are the variations achieved by *Mitsunobu reaction-type* exchanges from (*R*)-1-phenylpropan-2-ol to (*S*)-1-phenylpropan-2-NX, wherein inversion of configuration is complete to the amine compliment [8, 14, 19, 5, 34; route 2I and route 2P].

Chiral starting materials like phenylpropanolamine [11, 23, 29, 40, 53; route 2H] and phenylalanine [33, 25, 6, 9, 44; route 2O and route 2G] have been easy targets for precursors to the stereoselective synthesis of amphetamine. The routes from phenylalanine are variations on J.W. Wilson’s original article from 1977 [84; route 6BB] utilizing alternative reagents for the reduction of the carboxylic acid, alcohol to halide swap, reduction of the alkyl halide and BOC deprotection.

In the case of phenylpropanolamine as precursor, earlier literature [40,53, route 6P] make use of the chloro-pseudonorephedrine intermediate, as most typically seen in clandestine laboratories, however more recent literature [11, 23, route 6P] makes use of acetic anhydride to yield the ester for catalytic reductive removal of the OH moiety to amphetamine.

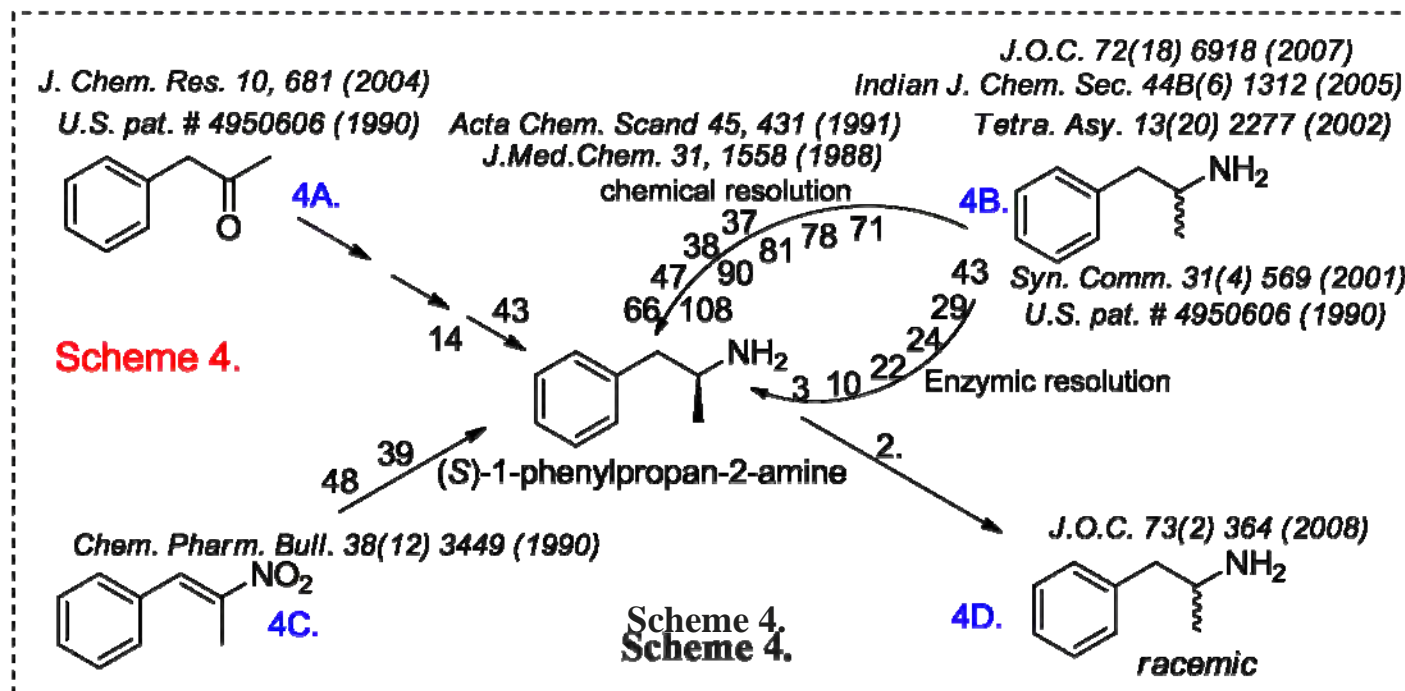
Creative chiral scaffolding has been used to introduce stereoselectivity early in the amphetamine synthesis [17, 49, 21; routes 2M, 2N and 2K]. These unique approaches start with the achiral, off-listed precursors, benzylbromide [21, route 1N] or 2-phenylacetaldehyde [17, 49, route 2K]. The stereoselectivity is introduced and controlled by simpler commercially available chiral directors. Interestingly, the Hofmann rearrangement, which retains stereoselectivity, was utilized at the end of route 2M [21] with the modern uses of hypervalent iodine [21]. Another older “classical synthesis” improvement was profiled in the Friedel-Crafts alkylation of benzene through the use of chiral (*s*)-2-(2,2,2-trifluoroacetamido)propanoyl chloride [55, route 2Q].

chemistry has been exploited in 3 different non-chiral routes, each starting from racemic 1-phenylpropan-2-ol [13, 17, 28; route 3A and 3D]. Achiral reductions of nitrostryene to amphetamine were the most popular approaches in this time period [4, 12, 35, 42, 46, 47, 56; route 3B]. These citations are primarily in the course of building pharmaceutical analogs / research. Organometallic (Grignard or lithium alkylation) reactions were used in a variety of alkylation reactions to amphetamine [15, 31, 52; route 3C, 3G and 3N]. These variations include Grignard ring opening of a phosphorylated-aziridine (nucleophilic ring-opening of *N*-phosphorylated aziridines) [31; route 3G], reaction with an electron deficient oxime (electrophilic amination of Grignard reagent) [15; route 3C], and lithium alkylation of an α -amino carbanion equivalent reaction [52; route 3N].

The amination of allylbenzene was affected in a base-catalyzed hydroamination reaction [27; route 3E]. This reaction is similar in precursor and product, however different in mechanism to the 1982 phosphoramidomercuration-demercuration of allylbenzene to amphetamine [58; route 6U]. Amination with a commercially available α -aminodiphenylmethane, which serves as an ammonia equivalent, was used for the hydroamination of 1-phenyl-1-propyne to amphetamine [26; route 3F].

Several citations occurred in the literature for the reductive amination of P-2-P to amphetamine [32, 22, 40; route 3H]. The classical malonic ester synthesis was used to construct 2-methyl-3-phenyl propanoic acid [37, route 3I] which was then converted to amphetamine via a Curtius rearrangement / hydrolysis [37]. A similar classical reaction, that of a Claisen / Dieckmann condensation, utilizing a benzylnitrile analog was used to construct a P-2-P complement [45; route 3K]. This analog was converted to the oxime, followed by reduction and de-sulfuration with sodium / ethanol to amphetamine [45; route 3K]. Finally, O-methoxy-oxime of P-2-P was reduced with Red-Al® to

Enzymic, Photo-induced and Chemical Manipulation of Amphetamine Isomers 1985 - 2009

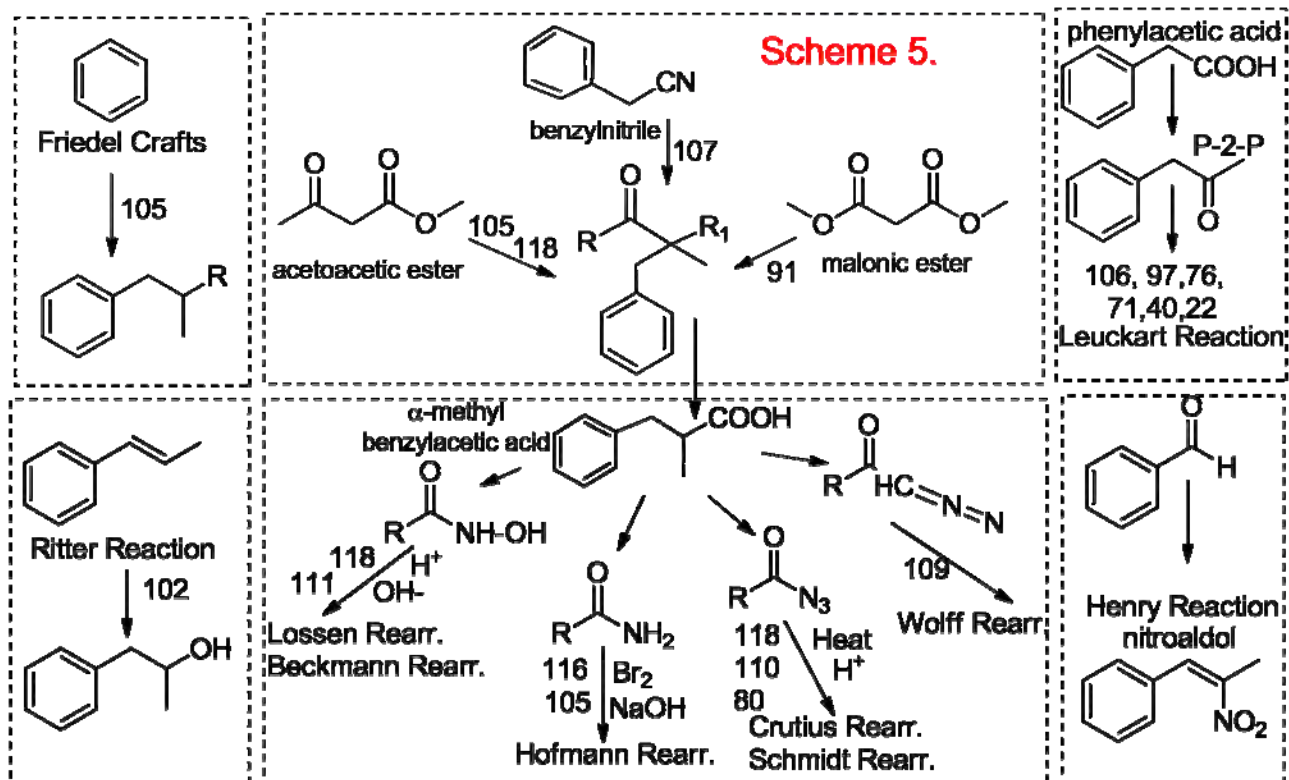


Discussion of Enzymatic, Photo-induced and Chemical Manipulation of Amphetamine Isomers: 1985-2009

Biotransformations have increased in interest, proof of concept and patent applications from **1985-2009**. Illustrated in Scheme 4 are the citations within this topic regarding amphetamine isomers. Both phenyl-2-propanone [14, 43; route 4A] and the nitrostyrene, (*E*)-1-(2-nitroprop-1-enyl)benzene [39,48; route 4C] have been used as starting points to the enzymatic synthesis to amphetamine. Alternatively, biotransformations of *racemic* amphetamine leading to the exclusion or enhancement of one isomer (enhanced ee) have been published or patented [3, 10, 22, 24, 29, 43; route 4B]. Conversely, one citation [2; route 4D] describes the photochemically induced-radical mediated racemization of the single amphetamine isomer to the racemic mixture. Classical methods of chiral resolution based upon chiral organic salts have been reported in the time frame of 1900-2009, with the use of D-(-)-tartaric acid [30, 47, 38, 71, 81a, 88, 90, 108], benzoyl-d-tartaric acid [38], di-p-toluoyl-d-tartaric acid [38], (*S*)-2-naphthylglycolic acid [66], α -amino acids [78] and optical-10-camphorsulfonyl chloride [37].

Organic Transformation from 1900 -2009:

Classical Organic Transformation in the Early 1900-1950's:



Classical Organic Transformation in the Early 1900-1950's:

The early literature regarding amphetamine synthesis of the 1900's was dominated by classical organic transformations (Scheme 5). These reactions like the Friedel-Crafts reaction [105,], Ritter Reaction [102], Leuckart reductive amination reaction [106, 97, 76, 71], nitro-aldol dehydration reaction, also called the Henry Reaction [116, 96, 94, 89, 87, 86, 85, 82, 70, 67] and rearrangement reactions that came to be known as the Hofmann rearrangement[105, 116], Curtius rearrangement [118, 110, 80], Schmidt rearrangement [80], Lossen rearrangement [118], Beckmann rearrangement [111] and the Wolff rearrangement [109], were productive routes to the synthesis of amphetamine. The non-amine component, α -methylbenzylacetic acid, was constructed with carbon-carbon bond formation via a carbo-anion enolate condensed with a suitable alkylhalide. These condensations, that were classically referred to as acetoacetic ester synthesis [105, 118] and malonic ester synthesis [91], later came to be referred to as cases of the Claisen condensation. In the case of phenylacetonitrile (benzyl nitrile) [107], the acidity of the central methylene hydrogens between the nitrile and aromatic ring, are used for abstraction and carbo-anion production before alkylhalide reaction.

Organic Transformation in the Early 1950-1985s:

Moving forward in time, from the period dominated by "classical organic transformations" (1900-1950), we enter a period for amphetamine synthesis that saw expanded interest in dissolved metal reductions and early chiral constructions. This time frame (1950-1985) was the focus of our previous review (*J. Forensic Sci. Int.* 42, (1989) 183-189) and highlighted catalytic reductions, dissolving metal reductions and metal hydride reduction leading to amphetamine. It was during this period that chiral complement to the Friedel-Crafts reaction was introduced for the synthesis of amphetamine [55]. Amination of a double bond was improved with the use of diethyl phosphoramidate [58], as well as acetonitrile mercuration [69] each leading to amphetamine. Reductive amination with (R)-1-phenylethylamine on the Schiff-base of phenyl-2-propanone followed by diastereoisomeric separation allowed for a chiral synthesis of amphetamine [64]. Later (1977, 1978), two chiral syntheses to amphetamine were published starting from D-phenylalanine [84a, 84b].

Summary:

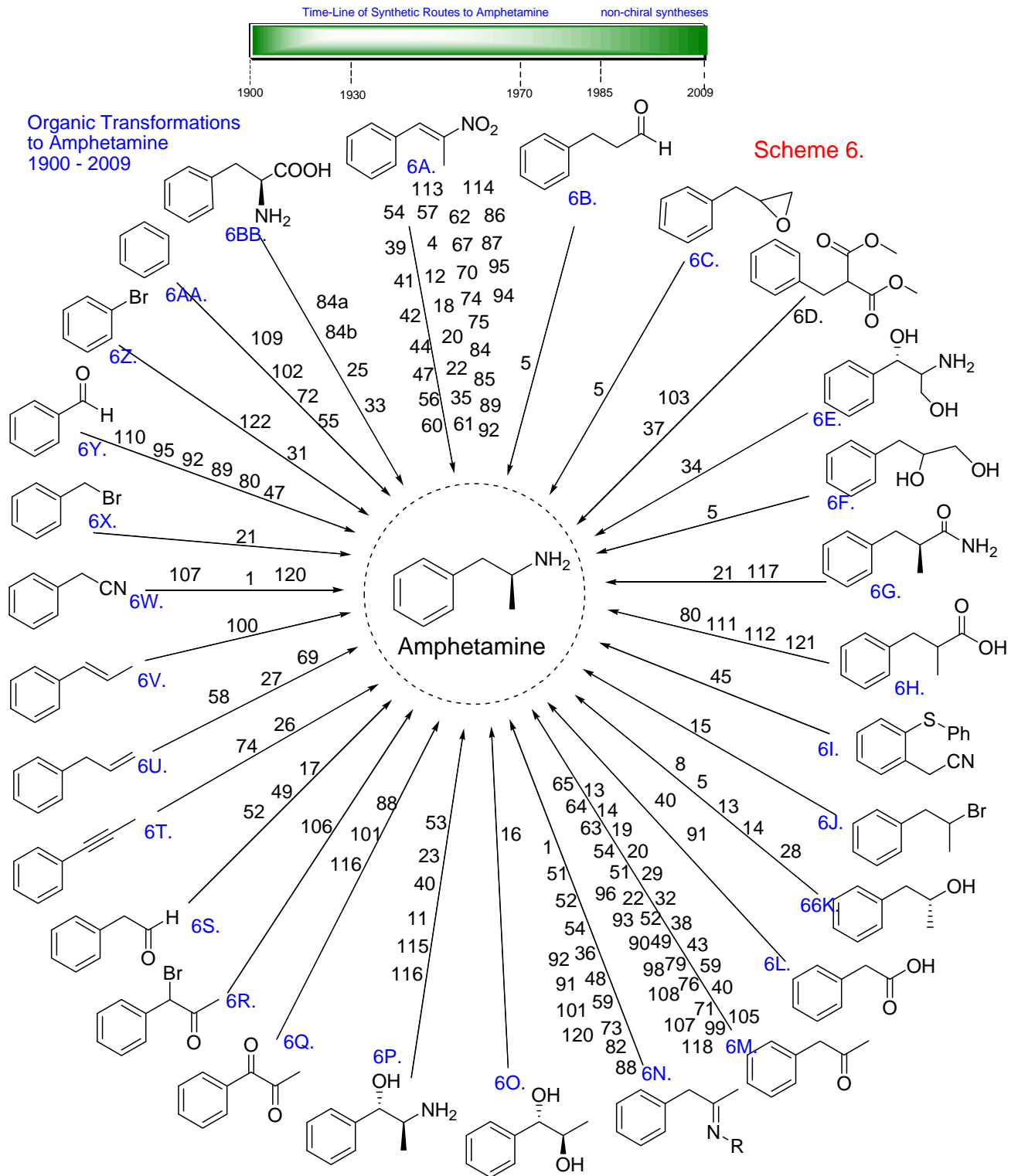
As best as possible the authors have attempted to summarize the synthetic transformations published within the period 1900-2009, with emphasis upon 1985-2009. The complete visual precursor / references to amphetamine pin-wheel is illustrated in Scheme 6 and is intended for the forensic chemist as a complete map of amphetamine routes / literature. These individual reactions are broken out, expanded and illustrated with added nomenclature in the supplemental material. Furthermore, precursor names via IUPAC (ChemDraw, Cambridge Software) are tabulated for the non-chemist with cross reference to literature citations.

Note:

Due to the length of this submission references and supplemental material were not put into the newsletter.

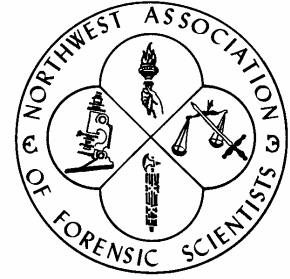
The full technical submission can be found at

www.nwafs.org



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Workshop Descriptions Proposed for Fall 2011

Workshop #1: The Forensic Considerations of Ammunition Reloading

Instructor: James Krylo, Las Vegas Metro Police Crime Lab

This one-day course will include a brief lecture about reloading and dedicate the rest of the day to reloading and shooting reloaded cartridges. Students will each receive a single hand press reloading tool with one die to keep after the workshop. Cartridges reloaded during the course will be test fired for accuracy, chronographed for velocity and the data collected and compared to factory loaded cartridges. Participants in this course will take the free train to the indoor shooting range for the live test firing portion of the course.

Workshop #2: Qiagen and DNA Analysis

Instructor: TBD

Workshop #3: Reproducing Bloodstain Patterns

Instructor: TBD

Using past CTS Proficiency and other known samples as a starting point, students in this one-day workshop will examine bloodstain patterns, assess how they thought they were made and attempt to reproduce the patterns in a controlled setting. Ultimately, students will make unknowns for their fellow students to evaluate and reproduce. Finally, lecture and group discussion will be developed to discuss the scientific method and validity of BPA in forensic examination and testimony.

Workshop #4: Tour Rainier Ballistics

Instructor: TBD

This half-day opportunity will provide an on-site tour of the bullet manufacturer "Rainier Ballistics". The entire process will be demonstrated from receiving billets of raw materials all the way through the completion of forming and marketing the various brands/designs of bullets they produce. This workshop is a must for anyone who needs to understand bullet performance and production. Travel to/from the facility will be arranged.

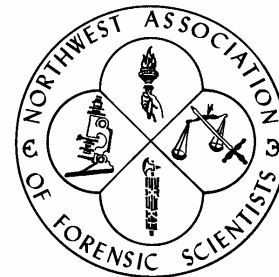
Workshop #5: The OMNI Car Crime Scene Processing Overview

Instructor: TBD

This half-day, practical-based workshop gives the student the opportunity to process a vehicle in stages where each stage covers a different aspect of scene examination. Useful for anyone who examines crime scenes, a car will be planted with each of the following types of evidence to process: a trajectory, a bloodstain to recover, a latent bloodstain to detect, a semen stain to detect, a hit & run transfer, a bloodstain pattern and a shoeprint. Lecture and practical exams will provide the student with a solid basis for vehicle processing of many different types of physical evidence.

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Workshop Descriptions continued...

Workshop #6: Examination of Clothing for Trace Evidence

Instructor: Chesterene Cwiklik

This is a two-day lab and lecture workshop on scientific clothing examination, emphasizing preliminary examinations of deposits and damage, getting to the "story" that the clothing can tell, and having a basis for sampling decisions. There will be an emphasis on documenting the examinations to ensure that the work is objective, the record is understandable, the exam is defensible in court, and the work can be understood even years after the original exam. Ms. Cwiklik is a co-author of the recently published book "Scientific Protocols for Forensic Examination of Clothing" and has taught Forensic Clothing Examination at the California Criminalistics Institute for the Ca DOJ and at the Washington State Patrol Crime Laboratory.

Workshop #7: Roundtable-Synthetic THC: Recognition, Examination and Analysis—or Roundtable-Contemporary Issues: Synthetic THC and Medical Marihuana

Instructor: TBD

This one-day workshop will provide a review and background data about the legal and illegal use of the recently popular "Spice" and other synthetic marihuana derivatives. Its origins, sources and legality will be discussed and the current literature will be examined to define what these new products are. The examination of these products will be compared to tradition examinations of Marihuana and its derivatives.

Workshop #8: Using Digital Photography with PowerPoint™

Instructor: TBD

This half-day workshop will use digital photographs (provided by the instructor or brought by the student) to demonstrate how to bring them into a presentation. These photographs will be used to build a variety of presentations using Powerpoint. Hyper linking slides and materials, labeling slides, and other good presentation skills will be emphasized, demonstrated and practiced.

Workshop #9: Using Digital Photography with PhotoShop®

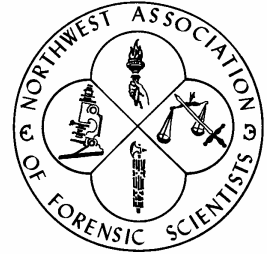
Instructor: TBD

This half-day workshop will use digital photographs (provided by the instructor or brought by the student) to demonstrate basic features of how to use Photoshop® to improve their appearance for demonstrative uses. Example photographs will then be processed and manipulated using Adobe Photoshop®. Building "to scale" images, preparing overlays, stitching multiple images and other useful techniques available in Photoshop will be demonstrated and practiced.



Special Research Workshops

Request to Participate



Special Research workshops are short, focused, one-day projects that conduct baseline research on a selected forensic question. NWAFFS will provide the facility, tools and equipment. The observations and data generated will be presented during the general session at the end of the week and be formally published (after peer review) in the NWAFFS Crime Scene publication. Each member of the work group will be approved by the Mentor and will contribute to setting up, conducting, recording and preparing the research for presentation and publication. The end product will list as co-authors the name of each participant.

If you would like to be considered for selection to participate in a special research project, please complete this form and forward to Matthew Noedel via email at mnoedel@att.net.

Name _____

Agency _____

Address _____

Phone _____ Email _____

Proposed Special Research Workshops

Special Research Workshop 1: Temperature of Ejected Cartridge Cases

The temperatures of fired cartridge cases just after ejection from a semiautomatic action will be studied and reported. Variables may include caliber and number of successive shots.

Special Research Workshop 2: Characterizing Bullet Damage in Clothing

Techniques to differentiate the passage of a bullet from other damage such as cigarette burns, wear and other defects in fabric will be examined characterized and reported.

Special Research Workshop 3: Blood Drying Times

This research group will evaluate various environmental factors that may influence drying time of blood deposits.

Special Research Workshop 4: Forensic Significance of Auto Paint Clear Coats

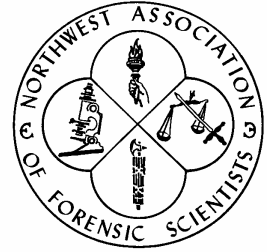
Sampling, characterization and analysis of clear coats will be examined and evaluated.

Special Research Workshop 5: Determining the Direction of Travel of Projectiles through Glass

This research will study the appearance of damage to window glass to determine direction of travel of a projectile. Fast versus slow moving projectiles will be compared and documented.

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Additional Information/payment
available online:

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HOTEL DETAIL

The conference will be held at the Hotel Murano in downtown Tacoma. You must contact the hotel directly for your room reservations **NO LATER THAN September 3, 2011**. Call their reservation line and specify the NWAFS rate of \$109/night. Internet is included with your room reservation!

Call: 888.862.3255

Online: www.hotelmuranotacoma.com

Fly into Sea-Tac Airport: Depending on the time of day, it will take from 25 to 50 minutes to get from the airport to the hotel. Car rental or shuttle options should be arranged!

For driving directions Google the location.

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Confronting Science: Melendez-Diaz and the Confrontation Clause

By Craig C. King, J.D. - This article printed with permission of Forensic Magazine.

"In this country if someone accuses you of something...the phrase still persists, 'Look me in the eye and say that'" - Justice Antonin Scalia

"The eyes are the window to the soul" -Persian proverb

In an interesting turn of its docket this year, the U.S. Supreme Court agreed to hear a case with an almost identical issue as a controversial decision from its last term.¹ That second bite at the apple, however, did not bear fruit, with this year's Court issuing a one-sentence opinion and sending it back down to the Virginia Supreme Court, merely instructing its members to make their ruling consistent with last year's *Melendez-Diaz v. Massachusetts*.² The *Melendez-Diaz* decision addressed the practice of using evidence affidavits in lieu of in-person testimony by forensic examiners, holding that the practice violates the Sixth Amendment to the U.S. Constitution. This article explores this decision and its implications for prosecutors relying on such examinations.³



Melendez-Diaz v. Massachusetts

In *Melendez-Diaz v. Massachusetts*, the court expounded on its previous ruling in the landmark case *Crawford v. Washington*, where it interpreted and explored the application of the constitutional provision found in the Sixth Amendment to the Constitution known as the Confrontation Clause. The Sixth Amendment's Confrontation Clause provides that "[i]n all criminal prosecutions, the accused shall enjoy the right...to be confronted with the witnesses against him."⁴ This bedrock procedural guarantee applies to both federal and state prosecutions.⁵ In the procedural history of *Melendez-Diaz v. Massachusetts*, the Massachusetts courts admitted into evidence affidavits reporting the results of forensic analysis, which showed that material seized by the police and connected to the defendant was cocaine. The case hinges on the issue of whether those affidavits are testimonial, rendering the affiants witnesses subject to the defendant's right of confrontation under the Sixth Amendment.⁶

In 2001, after receiving information on a drug transaction, Boston police officers arrested three men, among them Luis Melendez-Diaz. The officers had witnessed what appeared to be plastic bags containing drugs passed between the men. Once arrested, the three men were put in a police cruiser and transported to the station. After depositing the men at the station, the officers searched the police cruiser and found a plastic bag containing 19 smaller plastic bags hidden in the partition behind the front seat. They submitted the seized evidence to a state laboratory required by law to conduct chemical analysis upon police request.⁷

Melendez-Diaz was charged with distributing cocaine and with trafficking in cocaine in an amount between 14 and 28 grams.⁸ At trial, the prosecution placed into evidence the bags seized from the police cruiser. It also submitted three certificates of analysis showing the results of the forensic examination performed on the seized substances.

The certificates reported the weight of the seized bags and stated that the bags “have been examined with the following results: The substance was found to contain: Cocaine.”⁹ The certificates were sworn to before a notary public by analysts at the State Laboratory Institute of the Massachusetts Department of Public Health, as required under Massachusetts law.¹⁰

Melendez-Diaz objected to the admission of the certificates. He argued that the Confrontation Clause decision in *Crawford v. Washington*¹¹ required the analysts to testify in person. The trial court admitted the certificates, as was usual practice and pursuant to state law, as “prima facie evidence of the composition, quality, and the net weight of the narcotic...analyzed.”¹² Melendez-Diaz was found guilty. He appealed, contending, among other things, that admission of the certificates violated his Sixth Amendment right to be confronted with the witnesses against him.¹³

Justice Antonin Scalia, writing for a majority of the court, found that this rather common practice in many courts was, in fact, a violation of the defendant’s Sixth Amendment right to confront witnesses against him. They decided that the affidavits in question were testimonial in nature; that is, they were paper substitutes for live witnesses—live witnesses who can and should be cross-examined.¹⁴ To justify this outcome, the court relied on its previous ruling in *Crawford v. Washington*, where it explored the length and breadth of the confrontation clause.¹⁵

Crawford v. Washington

In 2004, the U.S. Supreme Court addressed the parameters of the Confrontation Clause in *Crawford v. Washington*.¹⁶ In this case, a recorded statement of a spouse was used against her husband in his prosecution. The marital privilege prevented the wife from testifying, so the prosecutor submitted her recorded statement. Crawford argued that this was a violation of his right to confront witnesses against him under the Sixth Amendment, and the Supreme Court agreed.¹⁷ The court concluded that the Confrontation Clause applies to witnesses against the accused, meaning “those who bear testimony.” Relying on this, the court stated, “The Framers would not have allowed admission of testimonial statements of a witness who did not appear at trial unless he was unavailable to testify, and the defendant had had a prior opportunity for cross-examination.”¹⁸ The court determined that a prior opportunity for cross-examination was mandatory and dispositive of whether or not testimonial statements of an unavailable witness are admissible. “Dispensing with confrontation because testimony is obviously reliable is akin to dispensing with jury trial because a defendant is obviously guilty.”¹⁹ Elaborating on the text of the Confrontation Clause,²⁰ the court stated,

It applies to “witnesses” against the accused—in other words, those who “bear testimony.”²¹ “Testimony,” in turn, is typically “[a] solemn declaration or affirmation made

for the purpose of establishing or proving some fact.”²² An accuser who makes a formal statement to government officers bears testimony in a sense that a person who makes a casual remark to an acquaintance does not. The constitutional text, like the history underlying the common-law right of confrontation, thus reflects an especially acute concern with a specific type of out-of-court statement.²³

The Ruling in *Melendez-Diaz*

The opinion authored by Justice Scalia described the class of testimonial statements covered by the Confrontation Clause as follows:

Various formulations of this core class of testimonial statements exist: ex parte in-court testimony or its functional equivalent—that is, material, such as affidavits, custodial examinations, prior testimony that the defendant was unable to cross-examine, or similar pretrial statements that declarants would reasonably expect to be used prosecutorially; extrajudicial statements...contained in formalized testimonial materials, such as affidavits, depositions, prior testimony, or confessions; statements that were made under circumstances which would lead an objective witness reasonably to believe that the statement would be available for use at a later trial.²⁴

The affidavits presented at the *Melendez-Diaz* trial were found by the majority of the court to fit into the above class and, were to them, very clearly affidavits and, thereby, subject to the Confrontation Clause.

There is little doubt that the documents at issue in this case fall within the “core class of testimonial statements” thus described. Our description of that category mentions affidavits twice.²⁵ The Confrontation Clause is implicated by extrajudicial statements only insofar as they are contained in formalized testimonial materials, such as affidavits, depositions, prior testimony, or confessions. The documents at issue here, while denominated by Massachusetts law “certificates,” are quite plainly affidavits: “declaration [s] of facts written down and sworn to by the declarant before an officer authorized to administer oaths.”²⁶ They are incontrovertibly a “solemn declaration or affirmation made for the purpose of establishing or proving some fact.”²⁷ The fact in question is that the substance found in the possession of *Melendez-Diaz* and his codefendants was, as the prosecution claimed, cocaine—the precise testimony the analysts would be expected to provide if called at trial. The “certificates” are functionally identical to live, in-court testimony, doing “precisely what a witness does on direct examination.”²⁸

According to the court in *Melendez-Diaz*, “our decision in *Crawford* [was that] the analysts’ affidavits were testimonial statements, and the analysts were ‘witnesses’ for purposes of the Sixth Amendment. Absent a showing that the analysts were unavailable to testify at trial and that petitioner had a prior opportunity to cross-examine them, petitioner was entitled to ‘be confronted with’ the analysts at trial.”²⁹

Application of *Melendez-Diaz v. Massachusetts*

Since the decision in *Melendez-Diaz*, there have been a number of cases where defendants have invoked the case to raise the question as to whether their Confrontation Clause

rights had been violated.³⁰ Defendants have tried to stretch the opinion in *Melendez-Diaz* to fit other circumstances where they believed there has been a violation.

In *United States v. Forstell*, Officer Pente Gillespie of the U.S. Park Police stopped defendant Scott P. Forstell while he was driving on the George Washington Parkway. Forstell was pulled over for speeding 62 miles per hour in a 40 miles-per-hour zone. While conversing with the defendant, Officer Gillespie noticed that Forstell smelled of alcohol and that his eyes appeared red and glassy. After the defendant was unable to perform a series of roadside sobriety tests satisfactorily, Officer Gillespie transported Forstell to a station house to administer a breathalyzer test to him.³¹

At Forstell's trial, the government called Officer Gillespie to testify about the events of May 8, 2009, and moved for the admission of five exhibits. Government Exhibit 1 is a certificate signed by a technician with the Radar Lab of Maryland certifying that a Speed Measuring Radar Device had been checked for accuracy and correctness of operation. Government Exhibit 2 is a certificate signed by a technician of the Radar Lab of Maryland certifying that tuning forks bearing serial numbers 093050 and 093084 had been tested and found to be operating properly.³² Government Exhibit 3 is the Intoxilyzer 5000EN Maintenance Record for the Intoxilyzer unit bearing serial number 68-*580 010813.³³ Government Exhibit 4 is a certification notice for Intoxilyzer model 5000EN, serial number 68-010813, and notes that the model has been tested and found to be suitable for use in analyzing breath alcohol.³⁴ Government Exhibit 5 is the results report for two breath tests administered to Scott P. Forstell on May 8, 2009, by Officer Gillespie.³⁵

Forstell claimed the admission of Government Exhibits 1 through 5 violated his rights under the Confrontation Clause as articulated in *Melendez-Diaz v. Massachusetts*. Forstell believed the accuracy of Government Exhibits 3 and 4 had not been established because the government did not provide testimony of the person who certified Government Exhibits 3 and 4 and did not allow him to cross-examine that person.³⁶

In *Forstell*, the court first examined *Melendez-Diaz* and then applied that ruling to its own facts.

In the instant case, Officer Gillespie testified that Sergeant Donald N. Upright, the U.S. Park Police technician who signed the certificates presented as Government Exhibits 3 and 4, was not present in the courtroom. Similarly, the technician who signed the certifications of accuracy for the laser and tuning fork, presented as Government Exhibits 1 and 2, respectively, also was not present in the courtroom. It is the defendant's position that exhibits 1 through 4 should not be admitted in the absence of the technicians' testimony. It is clear, however, that Government Exhibits 1 through 4 are nontestimonial and, thus, their admission does not run afoul of the Confrontation Clause. Indeed, the *Melendez-Diaz* decision explicitly notes that the court "d[id] not hold, and it is not the case, that anyone whose testimony may be relevant in establishing the chain of custody, authenticity of sample, or accuracy of the testing device, must appear in person as part of the prosecution's case."³⁷ Additionally, documents prepared in the regular course of equipment maintenance may well qualify as nontestimonial records."³⁸

The court further reasoned that Forstell did not argue that the certificates did anything more than verify the accuracy of the testing devices and equipment used by the U.S. Park Police. It concluded the information contained in Government Exhibits 1 through 4 merely confirmed that routine accuracy and maintenance tests were performed on the laser device, tuning fork, and Intoxilyzer 5000EN unit. Certificates regarding such routine information fit squarely into the category of nontestimonial records carved out by the Supreme Court. Thus, the government is not required to make available at trial the technicians who performed the tests for the certificates to be admissible.³⁹

When it came to the admission of Government Exhibit 5, it also was found not to be a violation of the Confrontation Clause. Government Exhibit 5 contained the results from the breath test administered to the defendant by Officer Gillespie. In addition to offering the exhibit at trial, the prosecution called Officer Gillespie to testify as to the steps he performed in administering the breath test to the defendant. Officer Gillespie stated that upon arriving at the District-2 substation, he offered the defendant a glass of water, read him his rights, and quoted him the chemical testing notice contained in 36 C.F.R. § 4.23. The defendant then indicated he would take the breath test. Officer Gillespie further testified that he sat across from the defendant for the requisite 20-minute waiting and observation period before administering the test and that the defendant did not vomit, hiccup, or burp during that time. Before conducting the test, Officer Gillespie inspected the defendant's mouth, as required, and then administered the first breath test at 1:52 a.m. The second breath test was conducted at 1:58 a.m. According to the officer's testimony, there was no radio interference with the test, and, before administering the test, he reviewed the unit's log book to verify that no problems had been logged with previous tests.⁴⁰

Finally, Officer Gillespie testified that he looked at the certification sticker on the Intoxilyzer unit to be sure that the expiration had not passed and also checked to be sure the solution in the unit had not expired. Accordingly, the defendant had the opportunity to cross-examine Officer Gillespie regarding any or all of these steps to determine whether he properly performed the test. Thus, with respect to Government Exhibit 5, the defendant's right to confrontation was satisfied by his cross-examination of Officer Gillespie.⁴¹

In *State v. Murphy*, the defendant tried to apply *Melendez-Diaz* to the admission of a certificate issued by the secretary of state relating to the suspension of his driver's license.⁴² Officer Christopher Woodcock, a police officer with the Cumberland Police Department, observed a vehicle stopped at a road that intersects Route 100 in Gray. Believing that he had pulled over the same driver days earlier for operating after suspension, Officer Woodcock turned his vehicle around and increased his speed in an attempt to view the vehicle's license plate number. He soon regained visual contact with the vehicle and eventually came upon it, with Murphy still inside, parked in a driveway. After running a check on the car's license plate, Officer Woodcock confirmed that Murphy's license was suspended. He made contact with Murphy and obtained his license, registration, and insurance information.⁴³

Murphy was charged with and pleaded not guilty to operating while license suspended or revoked⁴⁴ and unlawful use of a license.⁴⁵ Before trial, Murphy moved to exclude from

evidence a certificate issued by the secretary of state, asserting that the admission of the certificate would violate his Sixth Amendment right to confront witnesses.⁴⁶

The Supreme Judicial Court of Maine ruled “*Melendez-Diaz* might be interpreted as extending the definition of testimony beyond sworn certificates addressing scientific analysis prepared for purposes of a criminal prosecution, to include sworn certificates that authenticate and summarize routine governmental records. The opinion contains conflicting signals on this point. The court’s majority recognized that, by their nature, business and public records are not testimonial.”⁴⁷

Business and public records are generally admissible absent confrontation not because they qualify under an exception to the hearsay rules, but because—having been created for the administration of an entity’s affairs and not for the purpose of establishing or proving some fact at trial—they are not testimonial.⁴⁸

The court concluded that neither the certificate nor the records to which it refers are primarily maintained and employed for purposes of criminal prosecution. Identical certificates are routinely prepared for nonprosecutorial purposes, such as administrative motor vehicle proceedings and insurance-related inquiries.

The nature of the Confrontation Clause itself also guided the *Murphy* court.

Cross-examination guarantees that the accused has an opportunity, not only of testing the recollection and sifting the conscience of the witness, but of compelling him to stand face to face with the jury in order that they may look at him, and judge by his demeanor upon the stand and the manner in which he gives his testimony whether he is worthy of belief. Cross-examination has far less utility with respect to the information contained in the certificate at issue here. The Bureau’s collection and maintenance of motor vehicle license-related information are largely automated, and the data collected are not subject to any serious interpretation, judgment, or analysis. Our constitutional analysis should not ignore the context in which these records are produced. Because neutral, bureaucratic information from routinely maintained public records is not obtained by use of specialized methodology, there is little, if any, practical benefit to applying the crucible of cross-examination against those who maintain the information.⁴⁹

Defendants have asserted *Melendez-Diaz* violations regarding the admission of varied types of records maintained by police departments. In *State v. Fitzwater*, an officer in Hawaii issued a speeding ticket to a motorcyclist after “pacing” the motorcycle doing 70 miles per hour in a 30 miles-per-hour zone.⁵⁰ The defendant claimed his right to confrontation had been violated pursuant to *Melendez-Diaz* because the prosecution introduced into evidence a speed-check card. The speed-check card was a record kept routinely by the police verifying the accuracy of the speedometers on police vehicles. Fitzwater claimed he had a right to confront the mechanic who performed the test. Using similar reasoning related to business records, the Supreme Court of Hawaii rejected Fitzwater’s claims. The speed-check cards were not prepared with prosecution in mind and were

kept in the ordinary course of business; additionally, the officer driving the vehicle testified and was cross-examined by the defendant.⁵¹

Other attempts at applying *Melendez-Diaz* have included challenges to DNA results when a technician other than the one who conducted the test testified and the report was admitted. The Appellate Court of Illinois rejected this assertion—explaining confrontation was satisfied by the testifying technician who interpreted the results of the admitted report on the stand. Because the witness was a qualified technician able to testify about the report, there was no need to call the actual testing technician.⁵² Finally, the Confrontation Clause and *Melendez-Diaz* do not apply in probation revocation hearings, making probation reports admissible without the testimony of the preparer.⁵³

Conclusion

The decision in *Melendez-Diaz* provides additional clarity on the use of live testimony over the introduction of testimonial documents. Certain circumstances, such as the laboratory reports prepared for prosecution in the *Melendez-Diaz* case, require a person to take the stand and be subject to cross-examination, instead of merely submitting the testimonial document. This is in keeping with the Sixth Amendment right to confront witnesses against you. Determining when a document is testimonial is a new issue that lower courts still are exploring on a case-by-case basis.

By Craig C. King, J.D.

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Endnotes

1 *Magruder v. Commonwealth of Virginia*, 275 Va. 283, 657 S.E.2d 113 Va., (2008).

2 *Briscoe v. Virginia*, 130 S. Ct. 1316 (Mem) U.S., (2010).

3 *Melendez-Diaz v. Massachusetts*, 129 S. Ct. 2527 U.S.Mass., (2009).

4 *Id.*

5 *Pointer v. Texas*, 380 U.S. 400, 406, 85 S. Ct. 1065, 13 L.Ed.2d 923 (1965).

6 *Melendez-Diaz v. Massachusetts*, 129 S. Ct. 2527 U.S.Mass., (2009).

7 *Id.*

8 Ch. 94C, §§ 32A, 32E(b)(1).

9 App. to Pet. for Cert. 24a, 26a, 28a.

10 Mass. Gen. Laws, ch. 111, § 13.

11 *Crawford v. Washington*, 541 U.S. 36, 124 S. Ct. 1354, 158 L.Ed.2d 177 (2004).

12 Mass. Gen. Laws, ch. 111, § 13.

13 *Melendez-Diaz v. Massachusetts*, 129 S. Ct. 2527 U.S.Mass., (2009).

14 *Id.*

15 *Crawford v. Washington*, 541 U.S. 36, 124 S. Ct. 1354, 158 L.Ed.2d 177 (2004).

16 *Id.*

17 *Id.*

18 *Id.*

19 *Id.*

20 The most famous out-of-court statements in legal history used against a defendant on trial is the treason case of Sir Walter Raleigh. Raleigh was being tried in England for treason, a plot to remove the King; the evidence against him came mostly from the forced confession of an alleged coconspirator, Lord Cobham. Cobham's confession was placed into evidence, but Raleigh was repeatedly denied the opportunity to confront his accuser. The trial of Raleigh is notorious in the annals of legal history; it is often cited as being the catalyst for the Sixth Amendment, Confrontation Clause.

21 2 N. Webster, *An American Dictionary of the English Language* (1828).

22 *Crawford v. Washington*, 541 U.S. 36, 124 S. Ct. 1354, 158 L.Ed.2d 177 (2004).

23 *Id.*

24 *Melendez-Diaz v. Massachusetts*, 129 S. Ct. 2527 U.S.Mass., (2009).

25 See also *White v. Illinois*, 502 U.S. 346, 365, 112 S. Ct. 736, 116 L.Ed.2d 848 (1992) (THOMAS, J., concurring in part and concurring in judgment).

26 *Black's Law Dictionary* 62 (8th ed.2004).

27 *Crawford*, supra, at 51, 124 S.

Ct. 1354 (quoting 2 N. Webster, *An American Dictionary of the English Language* (1828)).

28 *Davis v. Washington*, 547 U.S. 813, 830, 126 S. Ct. 2266, 165 L.Ed.2d 224 (2006) (emphasis deleted).

29 *Melendez-Diaz v. Massachusetts*, 129 S. Ct. 2527 U.S.Mass., (2009).

30 *Melendez-Diaz* has even found its way into the employment context. In *Sutera v. Transportation Sec. Admin.*, Sutera was employed as a lead transportation security officer by defendant Transportation Security Administration (TSA). TSA policy requires employees to report to work free from any effects of alcohol or drugs; it mandates removal for offenses that involve the use of drugs or alcohol. The policy requires random drug and alcohol testing of designated classes of employees, including transportation security officers, such as Sutera, because they occupy safety- or security-sensitive positions. Sutera was asked to provide a urine sample for a random drug test. Following the test, the TSA held three predecisional meetings with plaintiff, informing and discussing with him the fact that his sample tested positive for marijuana. After his termination, Sutera invoked *Melendez-Diaz*, claiming that during his administrative hearings, he never was afforded the opportunity to confront the person or persons who tested his urine. The U.S. District Court for the Eastern District of New York was quick to point out that confrontation was a right reserved for "criminal" prosecutions and not informal administrative hearings.

31 *United States v. Forstell*, 656 F.Supp.2d 578, E.D.Va. (2009).

32 Specifically, the certificate states that the transmitter frequency of the Speed Measuring Radar Device bearing the serial number G2-2651 had been tested and found to be within the prescribed limits. According to the certificate, the Speed Measuring Radar Device is certified accurately within +/-1 mph (+/-2 kph) in stationary mode and/or +/-1 mph (+/-2 kph) in moving mode. Antenna 1, bearing serial number G2-05114 was found to have a transmitter frequency of 35.600 Ghz and a maximum aperture power density of 0.15 mw om. Antenna 1, bearing serial number G2-02981, was found to have a transmitter frequency of 35.600 Ghz and a maximum aperture power density of 0.15 mw om. In addition to noting that the laser being certified was model type GEN II, the certificate lists two serial numbers for associated units. These serial numbers, 093050 and 093084 match the serial numbers of the tuning forks that are the subject of the certificate marked Government Exhibit 2. Finally, the certificate marked as Government Exhibit 1 bears an expiration date of April 16, 2010.

33 Specifically, the certificate states that the tuning fork bearing serial number 093050 had been tested and found to oscillate at 3.74=5 Hz at 70 degrees Fahrenheit and will cause a Doppler traffic radar transmitting at 35.600 GHz to display 35.2 MPH Km/h and that the tuning fork bearing serial number 093084 has been tested and found to oscillate at 5.37 =5 Hz at 70 degrees Fahrenheit and will cause a Doppler traffic radar transmitting at 35.600 GHz to display 50.6 MPH.

34 The certificate, which is signed by Sergeant Donald N. Upright, a technician in the Traffic Safety Unit of the U.S. Park Police, indicates that on April 14, 2009, maintenance and instrument checks were performed on the Intoxilyzer unit.

35 *United States v. Forstell*, 656 F.Supp.2d 578, E.D.Va. (2009).

36 *Id.*

37 129 S. Ct. at n. 1. See also *Larkin v. Yates*, 2009 WL 2049991, n. 2 (C.D.Cal.2009) (noting that *Melendez-Diaz* "explicitly rejected the suggestion that the Confrontation Clause required that every person whose testimony might be relevant to the authenticity of sample or accuracy of a testing device appear in person as part of the prosecution's case").

38 *Melendez-Diaz*, 129 S. Ct. at n. 1.

39 *United States v. Forstell*, 656 F.Supp.2d 578, E.D.Va. (2009).

40 *Id.*

41 *Id.*

42 *State v. Murphy*, 991 A.2d 35, 2010 ME 28.

43 *Id.*

44 (Class E), 29-A M.R.S. § 2412-A(1-A)(D).

45 (Class E), 29-A M.R.S. § 2102(1) (2009).

46 *State v. Murphy*, 991 A.2d 35, 2010 ME 28.

47 *Id.*

48 *Id.*

49 *Id.*

50 *State v. Fitzwater*, 122 Hawaii 354, 227 P.3d 520 Hawaii (2010).

51 *Id.*

52 *People v. Johnson*, 394 Ill.App.3d 1027, 333 Ill.Dec., 774 Ill.App. 1 Dist., (2009).

53 *People v. Gomez*, 181 Cal.App.4th 1028, 104 Cal.Rptr.3d 683, Cal.App. 2 Dist., (2010).

BOOK REVIEW

Practical Forensic Digital Imaging: Applications and Techniques

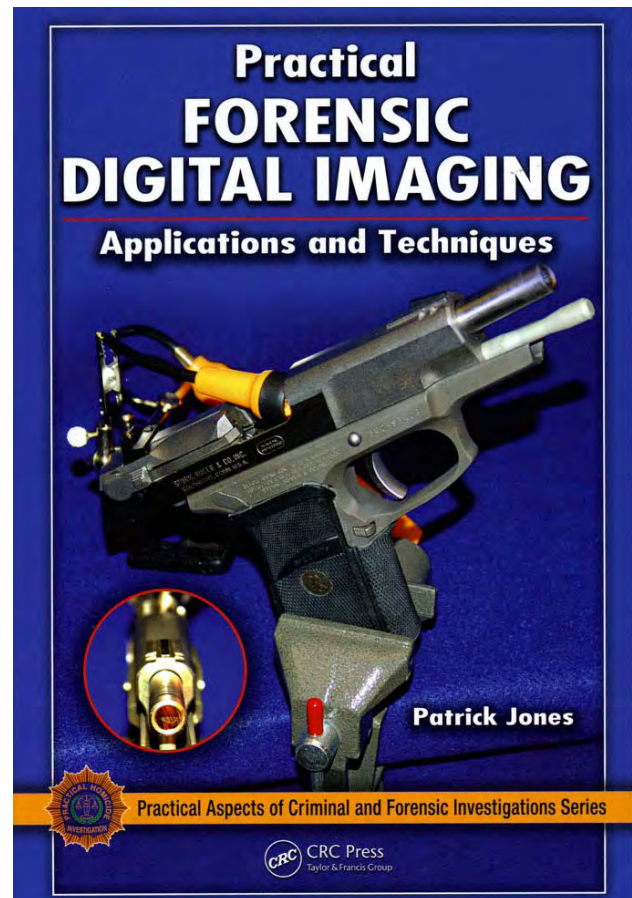
Patrick Jones,
CRC Press, *Practical Aspects of Criminal and Forensic Investigations Series*
ISBN: 978-1-4200-6012-6

Reviewed by
Jim Luthy, Forensic Scientist
Washington State Patrol Crime Laboratory

Some people have the wrong impression that I am a good photographer. The closer one works with me, the more they realize I have a lot to learn on the subject. Having just completed a specialized photography assignment in which my shortcomings were all too real, I eagerly awaited the arrival of *Practical Forensic Digital Imaging: Applications and Techniques* for the opportunity to review, relearn, and retool my photography skills. Despite the subtitle, however, I found too few “applications and techniques” to meet my expectations.

Practical Forensic Digital Imaging: Applications and Techniques is the latest in the “Practical Aspects of Criminal and Forensic Investigations Series” published by CRC Press. I’ve read some or all of several other books in the series and find them to be valuable pieces of our library.

The author, Patrick Jones, is the Forensic Science Laboratory director at Purdue University. A former Cook County (Illinois) Sheriff’s Office investigator, Jones clearly has expertise to share. Jones’ knowledge and experience is the meat of the book, but the meal is left incomplete without additional options or techniques, research, or additional information to support and augment what he presents.



The opinions expressed in this review are solely those of the author and are not those of the NWAFS nor the Washington State Patrol Crime Laboratory.

Jones does succeed in his stated purpose to write “so that your audience, the reader, understands what you are trying to describe.” With one exception I’ll describe later, the writing covers technical information in a very readable use of language. Although the book seems to make just a few assumptions as to what the reader already knows about photography, the writing could be easily understood by the most novice photographer.

There are some head-scratchers in the writing however. For example, in the chapter titled “Law” and under the subheading of “Miranda Warnings”, Jones writes one paragraph about Miranda warnings before recounting a story from Dr. Henry Lee about being questioned on the stand about the accuracy of measurement on a scale in the O.J. Simpson trial. I could make no connection between the story and Miranda warnings, nor was any connection made between Miranda warnings and the topic of the chapter or book.

The structure of *Practical Forensic Digital Imaging: Applications and Techniques* is hard to comprehend. The first four chapters look good in the Table of Contents, but there was no flow to the subjects covered within them. I felt as though I was being bounced around from subject to subject like I had taken my 2 year old granddaughter into a Toys R Us store. Footwear and Tire Impressions are covered in chapter 10, while Fingerprints (which require similar techniques) are covered in chapter 16. Different types of scenes – death investigation, morgue photo imaging, auto processing, burglary, arson, and sex offenses—are interrupted for chapters that seem out of place. Trace evidence and microscopy is covered in chapter 21, and then a digital photo imaging microscope is described three chapters later.

This brings me to the exception referred to earlier with regards to the writing style. In contrast to the remainder of the book, the chapter on Digital Photo Imaging Microscope reads more like a

technical and informational sales brochure for the VHX-1000 Digital Microscope. It came off as not-so-subtle product placement.

With some mining, however, the book offers some practical application. For example, painting a large dark scene with light is well described. There are a number of other nuggets in topics such as lighting, equipment, enhancement of images, and media storage. Unlike many books I’ve read where the first few chapters cover the premise of the book and the rest is filler, the chapters near the back of *Practical Forensic Digital Imaging: Applications and Techniques* were the most practical.

Each chapter ended abruptly, however, leaving this reader hungry for more information. Missing were details for overcoming a number of common problems faced when imaging a crime scene. The chapter on death investigation was interesting, for sure, but there was very little practical application for the investigator. Despite presenting several mock courtroom scenarios in which digital evidence was dismissed, there was no reference to case law pertaining specifically to digital images. Also, there were no alternative considerations provided to Jones’ methodology for documentation, processing a scene, enhancing digital images, and storage of digital media.

In chapter 17, an amusing photo is used to illustrate that all is not necessarily as it seems at the scene of a crime. Jones writes of the photo: “Figure 17.18 depicts a bedroom that could be perceived as a room that had been searched thoroughly by a burglar. In reality, it is the dorm room of one of my students. The only crime committed is the condition of the room.” Undoubtedly, the dorm room pictured has a lot of useful and valuable stuff lost in the clutter and disorder of the room. Likewise, Jones has amassed a distinguished career’s worth of useful and valuable information that is lost in the clutter and disorder of *Practical Forensic Digital Imaging: Applications and Techniques*.

BOOK REVIEW

Mechanics of Impression Evidence

David S. Pierce,
CRC Press
ISBN: 978-1-4398-1370-6

Reviewed by
Christopher Hamburg, Forensic Scientist
Oregon State Police Forensic Laboratory

Excited! I admit that this is a strange emotion to feel when reading the title of a new textbook on impression evidence. But how else is an impression examiner supposed to feel when reading the words “Mechanics of Impression Evidence”? The title implies a text that goes beyond the already well-covered aspects of impression evidence comparisons. This text is 221 pages including the appendix and index. It also included a preface, acknowledgements, biographies of the main author as well as three contributing authors, and an introduction. The introduction warns the reader that “The subject matter consists of unique observations regarding specific circumstances that are intended to generate more questions than they answer.” I believe the authors met this objective.

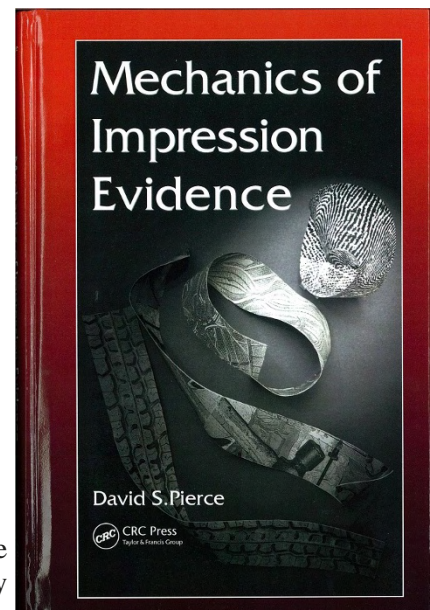
There are 12 chapters and an appendix as follows:

- 1: Forensic Analysis of Wood DNA
 - 2: Signs of Evolution
 - 3: Ivory Tower Syndrome
 - 4: The Ground We Walk On
 - 5: Measurement
 - 6: Fluids
 - 7: Surface Pairings
 - 8: Bias
 - 9: Exhibits to Evidence
 - 10: Validation Study of Three-Dimensional Striations from Outsoles
 - 11: Potential of Electrostatics
 - 12: Toward Development of a Unified Theory
- Appendix: Terminal Velocity Calculator

Even one who has a rudimentary understanding of impression evidence examination can see that the titles of each chapter are interesting to say the least.

For me, this book broke down into two sections. The first section contained discussions not directly related to the mechanics of impression evidence. This included chapters 1, 2, 3, 5, 6 and 8; about ½ of the book. This is clearly indicative of how often the book strayed from what I thought was its intended topic. For example, chapter 1 dealt with DNA of plant material. Although I like DNA as much as the next Impression Examiner, it was still DNA and not an introduction to my beloved impression evidence.

The opinions expressed in this review are solely those of the author and are not those of the NWAFFS nor the Oregon State Police Forensic Laboratory.



This group of chapters included the requisite reference to the 2009 “NAS report” that all forensic scientists should be familiar with. There are also basic discussions that included chemistry, physics, the scientific method, and measurement. I won’t cover in detail all of the ancillary discussions, but suffice it to say there were many. One interesting random fact that I was unaware of was included in the book; some of the earliest experiments on micro-waves involved popcorn.

As for the other six chapters that had some relevance to impressions evidence, they still left me wanting more. There were discussions on topics that included polymer deformation and soils. There was a short description of an experiment that involved a locomotive, rail, and coins. The topics directly related to the mechanics of impression evidence included discussions on surface pairings and numerous definitions that can be used when evaluating surface interactions. Chapter 10, the best chapter by far, begins with an experiment on striation repeatability and continues on with an in-depth examination on the viability of using striations as a method of individualization. These striations are the ones caused by some kind of linear movement. For example, a shoe that slips while stepping on soft soil may leave visible striations. The question is: are these striations unique? The experiment is well executed, but at this point, it is not in a completed form. This is an interesting topic that has not been previously well explored.

Chapter 11 introduces the possibility of being able to determine relative order of impressions based on a measurement of electrostatic signals of a substrate. Chapter 12 appears to serve as a summary of the ideas proffered earlier in the text. A discussion on design path and modeling techniques is included which briefly discuss the possible future of an AFIS-type system as well as a hypothetical footwear impression case involving a shoe that was a different physical size than the questioned impression and a different physical size than an off-the-shelf version of the same shoe in the same shoe size. The interaction of outsoles with various chemicals is also discussed in the text.

In all, there is at least one persistent idea worth mentioning: an examiner needs to be cognizant of the potential mechanisms of impression creation keeping in mind the types of materials present, if they were

affected by any fluids, and what forces may be involved. This will allow the examiner to properly create test impressions that better represent the condition of the object at the time of deposition.

Chemistry and physics are clumsily addressed in this text and are best left to university introductory textbooks. Various terms are misused, perhaps inadvertently or for simplicities sake, as seen on page 11 where force, pressure, and mass seem to be used interchangeably. Page 36 refers to forensic science as having a lack of reliability as noted by scientists and the “... American Academy of Science.” I believe this is a reference to the National Academy of Sciences, but that is unclear. The American Academy of Science is an entity, but there is little information that I found about it in my research to determine if they have ever had a stance on the reliability of forensic science. There are a few editorial errors including page 191 when the units of electrical charge transfer inexplicably change from nC/J to pC/J and back again without any change in numerical magnitude. Some of the language is clunky as on page 168 where the author states “The intention of these studies was to prove the validity of three-dimensional impressions.” I’m pretty sure that the author wants to prove the validity of the comparison of striations from a three-dimensional impression to a known object rather than the existence of three-dimensional impressions themselves. Page 178 contains reference to green, blue, and white outsoles of shoes used in an experiment, but all of the images are in black and white. There is at least one quotation of work produced by other authors (Dr. Itiel Dror and David Charlton on page 133) in the body of the text, but no reference is provided in the references section.

While this book failed to deliver the full experience that the title promised, it started to redeem itself in the later chapters. The book promised to create more questions than answers, and it succeeded. The authors challenged the readers to leave their ivory towers behind and think outside the box.

I would recommend this book to those impression examiners who are interested in pursuing some novel research ideas that can be inspired by this text. However, I would not recommend this for addition to the library of an impression examiner for use as a day-to-day reference.

TWGS/SWG UPDATES

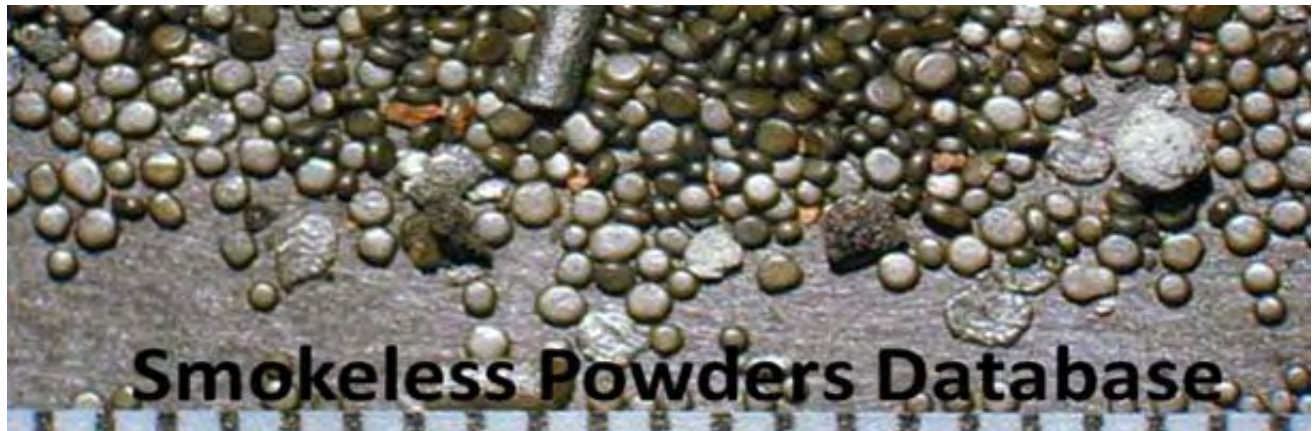
When I started to look at our membership I realized that there is a lot of our membership involved with technical/scientific working groups...you know who you are! I personally know that there is a lot of work that goes on in any committee in which one is on. Now, with the NAS report that recently came out, I know that these committees are working especially hard. Ideas such as standardization across a scientific discipline to report wording are either being worked on or continuously updated or reviewed. I know that when I have gone to a meeting, I have always tried to bring back something to share with the scientists that I work with. Well, there is no bigger group of scientists that I work with than the NWAFFS.

For this first installment, we have some valuable information from Rhonda Banks with SWGTREAD (Scientific Working Group for Shoeprint and Tire Tread Evidence) and myself with TWGFEX (Technical Working Group for Fire and Explosives).

Rhonda is part of the SWGTREAD resources sub-committee and her update of the March SWGTREAD meeting can be found on page 46.

As stated previously, I am a member of TWGFEX where I serve as a co-chair on the explosives database committee. I have been a participant on this working group for several years now and have had the privilege of working with co-chair Eamonn McGee with the Centre of Forensic Services, Toronto, Canada. We are finally seeing some of our hard work come to fruition as the committee is offering the smokeless powder database. Although we currently have only 100 powders entered so far, our goal (TWGFEX and the National Center for Forensic Science (NCFS)) is to populate with hundreds of more powders. The future for this database may also see the expansion with the population of smokeless powder substitutes and more. The database can be found at www.ilrc.ucf.edu/powders/. A look at the TWGFEX database home page can be found on the following page.

This will hopefully be the start of a long and informative installment for the *Crime Scene* newsletter but will be entirely up to those who serve on a committee to give me information to provide to our membership. Please don't be shy and give me an update of what you do for the TWG/SWG that you are on and share with our NWAFFS membership.



Smokeless powders are used for both civilian and military purposes. They are widely available for purchase by anyone who wants to hand load their own ammunition for recreational use. Smokeless powders may also be used to manufacture improvised explosive devices such as pipe bombs and as such are of interest to the law enforcement community.

The Smokeless Powders Database is a regularly updated reference collection of information and data on powders obtained from various sources including vendors and manufacturers. It is designed to assist the forensic explosives analyst in characterising, classifying and comparing smokeless powder samples based on their physical and chemical properties. Each database record contains a photomicrograph of each powder, source information, physical characteristics as well as GC-MS and FTIR data identifying the chemical components.

The database was developed by the Explosives Database Committee of the Technical Working Group for Fire and Explosions (TWGFEX) and is maintained by the National Center for Forensic Science (NCFS) at the University of Central Florida. It originates from the pioneering work of Ron Kelly of the Federal Bureau of Investigation and Wayne Moorehead of the Orange County Sheriff-Coroner Forensic Sciences Division in California.

www.ilrc.ucf.edu/powders/



SWGTTREAD UPDATE

An Update from the March 2011 meeting

By Rhonda Banks, Resources sub-committee

SWGTTREAD, the Scientific Working Group for Shoeprint and Tire Tread Evidence is a seventeen member board comprised of examiners (from state, local and federal agencies and private practice), researchers, and educators in the field.

The SWGTTREAD board met March 21-24, 2011, in Fredericksburg, VA. It was an action-packed week, and a lot of great work was accomplished. Here is a rundown of some noteworthy achievements:

SWGTTREAD.org

Wow! This is a fantastic website. SWGTTREAD.org has been reworked and is up and running. You will want to bookmark it and visit it frequently as the content is updated on a regular basis. The SWGTTREAD board hopes that this website will become an invaluable resource and communication tool for the community. Here are just a few “must see” things on SWGTTREAD.org:

SWGTTREAD Forum: This is a discussion forum that is only open to practicing footwear and tire examiners. It has already become a resource for the examiners who are using it. Stop in at SWGTTREAD.org and register through the Forum tab at the top of the home page. I look forward to seeing some new members from the Northwest.

Tread Typer: This is the SWGTTREAD version of a “wanted page”. It is now live on the SWGTTREAD forum. If you are having a difficult time finding the solution to a make/model request, take advantage of the knowledge and resources of your fellow examiners by posting images of your impressions on the Tread Typer.

Resources: All of the SWGTTREAD standards and guides are posted on the website. Some of the old C.A.S.T. website resources have been brought onto the website and more will be coming online soon. Admissibility resources and a bibliography are in progress and we hope to bring those to you soon as well.

STANDARDS

A revision to the Standard Terminology document has been produced. The draft will be available for public comment via the website within a couple of weeks following the meeting. Please give your input.

The SWGTTREAD Resources Committee would like your help in keeping the website up-to-date and interesting. If you are aware of current reading materials that might be of interest to the community or if you have an idea for something to add to the resources page, please forward them to me at rhonda.banks@state.or.us.

NWAFS NOTES

Spring is typically associated with cleaning up and starting afresh. For me, spring means getting the first chance of the year to go fishing with several good friends. Since 2004, Matt and I have been going fishing for Chinook salmon (we call these fish “Springers”) on the mighty Columbia River with our friend Rick. The Chinook salmon, *Oncorhynchus tshawytscha*, is an anadromous fish that is the largest species in the salmon family. It is a Pacific Ocean salmon that can live up to 7 years and reach up to 125 pounds.



2010 image, from left to right:
Rick Kemman, Paul Martin, Jeff Jagmin *the Editor* and Matt Noedel *the President*

We recently added an additional member on the yearly excursion, Paul Martin with Craic Technologies, who just completed his 2nd trip. This year we, I mean Paul, caught the only fish and it weighed 25+ pounds!

Jeff Jagmin

MEETING ANNOUNCE-

Association of Firearm and Tool Mark Examiners

AFTE May 29—June 3, 2011

Chicago, IL

www.afte.org



Inter/Micro: 62nd Annual Applied Microscopy Conference

July 11 - 15, 2011

Chicago, IL

www.mcri.org

96th Annual IAI International Educational Conference

August 7 - 13, 2011

Milwaukee, WI

<http://www.theiai.org/conference/2011/index.php>



2011 Trace Evidence Symposium: Science, Significance and Impact

August 8 - 11, 2011

Kansas City, MO

<http://www.ojp.usdoj.gov/nij/events/trace-evidence-symposium/>

International Association of Bloodstain Pattern Analysts

October 3-7, 2011

Milwaukee, WI

www.iabpa.org



University of Northern Colorado and the Southern Institute of Forensic Science present

Forensic Anthropology Courses Offered in New Orleans July 2011

These are hands-on, practical courses that can be taken for 3 hours of college credit or for 4.0 CEUs toward your professional development.

Forensic Anthropology — July 11–16
ANT 330-630 (3 credits) / NCCJ 006-630 (4 CEUs)
Guest Lecturers: Rick Snow, Ph.D. & John Verano, Ph.D.

This intense one-week course covers the principles of forensic anthropology and crime scenes documentation techniques as applied in criminal investigations. The fundamentals determining the biological profile as well as determining trauma from the human skeleton will be examined, thus providing the student with an understanding of how identifications are made using only bones. The course also introduces the principles of forensic archaeology and how they are frequently used in the excavation of clandestine graves. This course is a combination of lecture, lab exercises and practical exercises.



Fragmentary Osteology, Bone Trauma, and Basic Bone Pathology — July 18–23
ANT 408-631 (3 credits) / NCCJ 009-631 (4 CEUs)
Guest Lecturers: Rick Snow, Ph.D. & John Verano, Ph.D.

This course will allow students to examine fragmented bones of the human skeleton. A basic understanding of skeletal anatomy is required. Law enforcement, death investigators, and forensic anthropologists who are called to investigate skeletal cases often are confronted with bone fragments. These fragments must be identified. Study of basic bone pathologies may help identify the individual. Disease processes must also be identified so that the lesion is not confused with bone trauma. An examination of the skeleton with trauma should help establish the cause of death or allow a determination if the trauma was sufficient to be the cause of death.

Facial Reconstruction: Combination Method Workshop — July 25–30
ANT 408-630 (3 credits) / NCCJ 007-630 (4 CEUs)
Guest Lecturer: Roy Paschal, IAI Forensic Artist

This course will focus on three-dimensional forensic facial reconstruction. This proven method can be used for forensic identifications or historical reconstructions. The method blends facial anatomy and average facial tissue depths to give the sculpture the best possibility for an accurate likeness of an individual. Space is limited to 15 participants. Register early.

Register Now! Registration ends June 20.
More information and registration details are on page 2.

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CAPTION THIS!



The best caption submitted for this photo will win a \$20 gift card of your choice!

editor@nwafs.org

CAPTION THIS WINNER!

Congratulations to our last
newsletter's winner:

Aaron Brudenell
Arizona DPS Crime Laboratory

“Miniature spokes model Claudia Thomas was on her way to a promising career in specialty advertising for “minus size” models when her glamour shot showing off the new Compact Fluorescent light bulb doomed the technology for nearly 60 years.”



Runner up goes to:

Joshua Spatola,
California Department of Justice

*“Gentlemen, if you truly want to say “I’m sorry”...
Introducing the 8 Giga-Carat diamond ring, Tiger Woods Special Edition, from
Tiffany & Co. Anything less, and be prepared to suffer the consequences.”*

FREE REGISTRATION!

Got an interesting technical note, informative article
or research project?

Make a submission to the NWAFS newsletter, and you could win
FREE REGISTRATION to an upcoming NWAFS meeting!

The officers vote for the “Best Independent Newsletter Submission”
once per year and award a **FREE REGISTRATION** to the winner.



Help keep the NWAFS newsletter interesting and informative by
sending your submissions to:

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