

Broadening Perspectives on Our Forensic Science Discipline and Introducing the AAFS

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1. Introduction

In its efforts to keep IAAI members informed about developments in the standards world, the Fire Investigation Standards Committee (FISC) usually uses the FISC Bulletin Board to publicize developments respecting particular standards that relate to fire investigations. The ones we primarily write about are NFPA 921 *Guide For Fire & Explosion Investigations* (NFPA 921) and NFPA 1033 *Standard for Professional Qualifications for Fire Investigator* (NFPA 1033). These two standards¹ are governed by the standards development organization known as the National Fire Protection Association (NFPA). While important, they are not the only standards relevant to fire investigations. Nor is the NFPA the only standards development organization creating standards that IAAI members should know about.

This article will assist our readers to broaden their perspectives as a result of the fact that our field is being included among the forensic sciences. Rather than evolving at its own pace with its own self-contained goals, fire investigations will be increasingly influenced by factors affecting all forensic sciences. For example, the need to improve the reliability of its methodologies by continued development and implementation of industry standards.

There is also a move afoot to create interdisciplinary standards that can lead to uniformity across disciplines.² This suggests that fire investigators should be aware of standards development activities within other disciplines that may also pertain to fire investigations. Projects such as a common lexicon for all forensic sciences is an important development about which fire investigators should know.

Fire investigations is but one field of many that may be relevant to a given case. An investigator or lawyer who is coordinating a case needs to be aware of other forensic science disciplines that may help the investigation and where to find the applicable standards. It would be a big risk to involve an expert from any forensic discipline without being able to determine if that expert was staying current on the relevant standards in his or her field. This column begins with a history lesson to show why recognizing shifts in the underpinnings of our field is so important. When it was first published, some lawyers and investigators resisted the idea that the groundbreaking *Daubert v. Merrell Dow Pharmaceuticals Inc.*³ opinion applied to fire investigators. In retrospect, it would have been better to tackle head on the change heralded by this case. We hope to put our readers ahead of the curve in dealing with the impact of the move of fire investigations into the forensic sciences.

Next, we provide a brief summary of the entry of fire investigations into the forensic sciences through the combined efforts of organizations

like the National Research Council (NRC), the National Commission on Forensic Sciences (NCFS), and the Organization of Scientific Area Committees (OSAC).

Finally, we introduce the American Academy of Forensic Sciences (AAFS), which has long included fire investigations among its scientific endeavors. Little-known are the benefits the AAFS makes available for IAAI members. We also touch upon AAFS's Academy Standards Board (a standards development organization) that is creating standards that may affect the use of canines in fire investigations. We close by mentioning the Forensic Specialties Accreditation Board (FSAB), created by the AAFS. FSAB is one of the accrediting bodies for the IAAI-CFI® program.⁴ By tying together all of this information we hope to achieve our overarching goal of introducing new avenues through which our readers can keep abreast of changes in the forensic sciences impacting our field.

2. Lessons From the Transition of Fire Investigations from Art to Science

As we have learned through the use of NFPA 921 and NFPA 1033 in litigation, industry standards can be powerful tools in the hands of knowledgeable experts and adept trial lawyers. Standards can help ensure that experts have adequate qualifications for their work in the field and in court. They can also direct people in the methods required for competent investigations. When relevant standards are not followed, attorneys can use them to challenge the admissibility or weight of an expert's evidence in court. Thus, fire investigators and those in related fields should monitor issues affecting the forensic sciences, staying alert for matters such as the development of new standards or court decisions that could affect any aspect of fire investigations.

A lesson from history will help demonstrate the potential significance of this movement of fire investigations into the forensic sciences. Many will recall that the *Daubert*⁵ decision was handed down by the United States Supreme Court in 1993. For too long afterwards, this revolutionary decision was widely ignored by the fire investigation community. Why? Because it set the standard for the admissibility of expert evidence in matters of "science." Some argued that as fire investigation was not a scientific endeavor, the *Daubert* decision did not govern the admissibility of expert evidence in fire investigations. Wrong!

As years passed, the number of decisions multiplied in which the *Daubert* standard was used to exclude expert testimony of fire investigators. The fire investigation community had to scramble to catch up and learn how to deal with the important changes signaled by *Daubert*. Not only has it become clear that fire investigation is based on science, but the legal ramifications of this shift have had an enormous impact. Unfortunately, this failure to recognize and adapt to the movement of fire investigations from the realm of art to the world of science exacted a heavy price on some investigators' careers. Now a similar shift is taking place as fire investigations takes its place among the forensic science disciplines.

3. The Shift to a Forensic Science Discipline

The recognition of fire investigations as a forensic science discipline began with the 2009 report of the National Research Council (NRC) that was published by the National Academy of Sciences (NAS), *Strengthening Forensic Science in the United States: A Path Forward* (the *NRC/NAS Report*)⁶ Previous FISC Bulletin Board articles have introduced the *NRC/NAS Report* and its eventual impact on fire investigations.⁷ The authors of this report subjected many forensic science disciplines to far-ranging

analysis and criticism. It also made a brief reference to fire pattern interpretation and the need for further research to put arson investigations on a more solid scientific footing.⁸

Suffice it to say that the result of this lengthy and detailed report was to initiate the much-needed overhaul of forensic sciences, not only in the United States, but worldwide. The broad way in which the *NRC/NAS Report* characterized forensic science disciplines, together with its reference to fire pattern interpretations opened the door to include fire investigations with other forensic science disciplines in this overhaul.⁹

In 2013 the U.S. Department of Justice (DOJ) in partnership with the National Institute of Standards and Technology (NIST) took a major step in responding to the *NRC/NAS Report* by establishing a Federal Advisory Committee called the "National Commission on Forensic Science" (NCFS). The purpose of the commission was to enhance the practice and increase the reliability of the forensic sciences nationally.¹⁰ One of its early tasks was to define "forensic science" and related terms for the purpose of its work. As is shown below, its definitions were broad enough to include fire investigations within the forensic sciences.

In April 2015 NCFS adopted a "Universal Accreditation" policy recommendation that "all forensic science service providers (FSSP) become accredited."¹¹ Fire investigation was specifically cited as an example of the types of functions that would qualify as a forensic science service.¹² For the purposes of this recommendation, a FSSP is defined in accordance with a definitions document adopted by NCFS that defined "forensic science" and related terms for the purposes of its work generally. These definitions are instructive, as they are broad enough to include fire investigations:¹³

FORENSIC SCIENCE – The application of scientific or technical practices to the recognition, collection, analysis, and interpretation of evidence for criminal and civil law or regulatory issues.

FORENSIC SCIENCE SERVICE PROVIDER – A forensic science agency or forensic science practitioner providing forensic science services.

FORENSIC SCIENCE PRACTITIONER – An individual who (1) applies scientific or technical practices to the recognition, collection, analysis, or interpretation of evidence for criminal and civil law or regulatory issues, and (2) issues test results, provides reports, or provides interpretations, conclusions, or opinions through testimony with respect to such evidence.

A plain reading of these definitions indicates that fire investigations fall within the realm of forensic sciences. This interpretation makes sense in light of NCFS's Universal Accreditation recommendation in which fire investigation was specifically provided as an example of a function of an FSSP.

NCFS' charter expired on April 23, 2017. The work of the short-lived NCFS was cutting-edge. Its work products are still available on the DOJ website (<https://www.justice.gov/archives/ncfs>) and are worth studying as they reveal future trends that we expect will eventually impact forensic science disciplines including fire investigations. Its business document, *Reflecting Back - Looking Toward the Future*,¹⁴ summarizes NCFS' accomplishments and identifies work to be addressed going forward.

4. OSAC

By way of a second initiative to implement recommendations in the *NRC/NAS Report*, in 2013 DOJ and NIST collaborated to launch OSAC. OSAC's mission is "to strengthen the nation's use of forensic science by facilitating the development of scientifically sound forensic science standards, and by promoting the adoption of those standards by the forensic science community."¹⁵ While NCFS provided policy recommendations to DOJ and to OSAC, OSAC's focus is on the practice of the forensic sciences. Two of OSAC's aims are to:¹⁶

- populate the OSAC Registry of Standards
- promote the use of OSAC-endorsed standards by the forensic community, accreditation and certification bodies, and by the legal system

In promoting forensic science standards, the OSAC Registry is of prime importance. The standards and guidelines in the Registry will have several uses. Forensic practitioners can use them to improve the reliability and

validity of their analyses; judges and lawyers can use them in court to assess opinions of forensic experts; and accreditation bodies can use them to audit FSSPs¹⁷ to ensure they meet the required standards of practice. While many of OSAC's stakeholders are those involved with forensic laboratories, fire investigations are very much a part of OSAC's work in the forensic sciences. A case in point: NFPA 921 and NFPA 1033 were among the first documents to be approved for OSAC's Registry of Standards.¹⁸

The OSAC organization is complex¹⁹ but for our purposes it is important to understand that five Scientific Area Committees (SACs) oversee 25 discipline-specific subcommittees. Of most concern to fire investigators will be the activities of the subcommittees listed below. The first three are part of the Crime Scene/Death Investigation SAC, and the last one is part of the Chemistry/Instrumental Analysis SAC:

- **The Fire & Explosion Investigation Subcommittee** focuses on standards and guidelines related to the investigation, analyses and interpretation of crime scenes where arson or use of explosives is suspected. See this subcommittee's webpage for details of its members, Registry Approved Documents, Documents in Process (including a draft Standard for the Organization and Operation of Fire Investigation Units), Research and Development Needs, and Discipline-Specific Baseline Documents (including nine ASTM standards). Here is the URL for the webpage: <https://www.nist.gov/topics/organization-scientific-area-committees-forensic-science/fire-explosion-investigation>.
- **The Dogs & Sensors Subcommittee** focuses on standards and guidelines related to performance of deployed dog/handler teams and optimization of their combination with electronic detection devices. You can find the same types of information on this subcommittee's webpage as listed above for the Fire & Explosion Investigation Subcommittee on its webpage: <https://www.nist.gov/topics/organization-scientific-area-committees-forensic-science/dogs-sensors-subcommittee>. Any fire investigator who has any investigations involving canines should track the activities of this subcommittee as some of the standards it is developing apply to ignitable liquid detection canines (*i.e.* arson dogs). The canine standards are being developed through AAFS's Academy Standards Board (rather than the NFPA).
- **The Crime Scene Investigation Subcommittee** supports development of standards and guidance for crime scene investigations. Its webpage is available at: <https://www.nist.gov/topics/organization-scientific-area-committees-forensic-science/crime-scene-investigation>. It is worthwhile to explore the standards-development projects of this subcommittee because crime scene handling, processing, and documentation overlap the work of fire investigations. There are also ASTM standards used in fire investigations that have been submitted by this subcommittee into the Registry approval process.
- **The Fire Debris & Explosives Subcommittee** focuses on standards and guidelines related to the scientific examination and analysis of materials associated with fire and explosion investigations. Its webpage is available at: <https://www.nist.gov/topics/organization-scientific-area-committees-forensic-science/fire-debris-explosives-subcommittee>. There is a wealth of information available on this webpage pertaining to fire debris analysis and explosives analysis, including relevant ASTM standards, a comprehensive Reference List for the analysis of fire debris, and other historical references and resources.

Fire investigators or lawyers are usually responsible for coordinating the evidence in a given case. It is not enough to rely on NFPA 921 or NFPA 1033 for knowledge about other areas of expertise that may be relevant to a given investigation. Above, we have pointed you to the OSAC subcommittees that have standards governing forensic science disciplines most obviously related to fire investigations. Those coordinating the investigation or subsequent litigation should check the resources available on the OSAC subcommittees webpages to ensure that the experts selected to work on the case are knowledgeable about relevant standards governing their discipline.

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Further, OSAC includes other forensic disciplines that may be relevant in a particular investigation, for example, video/imaging technology and analysis, disaster victim identification, odontology (forensic dentistry), and footwear/tire analysis, to name a few. One of the quickest ways to become acquainted with the standards and other documents governing and discipline is to explore the OSAC subcommittees webpages.

5. OSAC 2.0

In September 2019, NIST announced its plans for OSAC 2.0. One of the upcoming changes in OSAC 2.0 that may affect fire investigations is the plan to develop interdisciplinary standards that can bring uniformity across disciplines.²⁰ Finally, the number of OSAC subcommittees will be reduced from 25 to 17, as subcommittees that have overlapping content areas and could benefit from working together will be combined.²¹

6. OSAC's Lexicon

An early step towards uniformity across disciplines has begun with OSAC's creation of a lexicon.²² It already has over 4000 terms and is a database that is easily searchable. Dozens of the definitions were provided by the OSAC Fire and Explosion Investigation Subcommittee, with many of them coming from NFPA 921 or NFPA 1033. Those wishing to explore the lexicon are invited to first watch the short introductory video available through a link on the OSAC Lexicon's homepage,²³ which explains how to search, filter, or browse the database.

While we would expect that as OSAC continues to refine the terminology in its lexicon over time, it is worthwhile for our readers to check the lexicon for inconsistent definitions of same or similar terms used in different forensic disciplines. Such inconsistencies could be used to challenge the opinion of an expert who uses a term that is defined in different ways.

For example, the Chemistry Scientific Area Committee has added to the lexicon the term "Burn Pattern(s)," defined as, "Patterns created when applied heat fluxes are above the critical thresholds to scorch, melt, char, or ignite a surface." The Fire and Explosion Investigation Subcommittee added the term "Fire Pattern(s)," defined as, "The visible or measurable physical changes, or identifiable shapes, formed by a fire effect or group of fire effects." These terms have been treated as interchangeable. Although each definition may be correct, the differences could create confusion in the mind of an investigator, an attorney, a judge, or a jury. Further, the term "burn pattern" has fallen into disfavor in the fire investigation community. This is but one example of a reason that fire investigators should be aware of what is going on in related forensic science disciplines.

Another example is that with the growing recognition that fire investigation is one of the forensic sciences, methods used by attorneys to challenge experts in other forensic disciplines may bleed over into cases involving fire investigation experts. Take challenges under the *Daubert* standard for example. One troubling strategy on the horizon for fire investigators is one prong of *Daubert's* reliability test – error rate. Until recently fire investigators were rarely challenged on their failure to have established error rates for fire pattern interpretation. Perhaps it was generally thought that error rates were for tests conducted in labs. However, other forensic disciplines are now being hit hard where there is a lack of an established error rate. Treating fire investigations in the same way as other disciplines, attorneys are now beginning to use the lack of an error rate against fire investigation experts. This trend would be predictable for anyone following litigation tactics involving other forensic sciences.

7. AAFS

In addition to NCFS and OSAC treating fire investigations as a forensic science, so does the American Academy of Forensic Sciences (AAFS), the most prestigious forensic science organization in the world.²⁴ AAFS is "a multi-disciplinary professional organization that provides leadership to advance science and its application to the legal system."²⁵ AAFS consists of 11 Sections whose membership encompasses every recognized forensic activity from anthropology to wildlife investigations. Its objectives are "to promote professionalism, integrity, competency, education, foster research, improve practice, and encourage collaboration in the forensic sciences."²⁶ It does so through a number of vehicles, including the *Journal*

of Forensic Sciences (JFS) (its internationally recognized, peer-reviewed scientific journal), its annual scientific meeting, and its website. The AAFS also initiates actions and reactions to various issues of concern. AAFS members²⁷ are among the prominent experts selected to join: 1) the NRC committee that wrote the *NRC/NAS Report*, 2) NCFS, and 3) OSAC.

In the context of the purpose of this article which is to broaden perspectives about fire investigations within the forensic science community, let's first consider the benefits for IAAI members attending the AAFS Annual Scientific Meeting. The AAFS annual scientific meeting is held each February when "approximately 5,000 world-renowned professionals present the most current information, research, and updates in their field and [m]ore than 900 scientific papers, seminars, workshops, and other special sessions are presented."²⁸ IAAI members are eligible for reduced meeting registration fees and pay the same as AAFS members (\$375 for pre-registration/ \$500 for on-site registration, a discount from what other non-AAFS members pay — \$560/\$600).²⁹

A myriad of sessions relating to fire investigations are offered. At the February 2020 meeting, topics covered include advances in fire debris analysis (Criminalistics), identification of remains and other issues in the Camp fire (Odontology and Anthropology), electrical fires vs. arson (Engineering and Applied Sciences), ventilation in full scale structure experiments (Eng App Sci), recovery of data from fire-damaged mobile devices (Digital and Multimedia Sciences), and case studies of fire investigations presented by experts in various disciplines. By definition, "forensic" means, "relating to, used in, or suitable to a court of law,"³⁰ therefore it is no surprise that there is a Jurisprudence Section that offers several days of presentations on diverse topics relating to forensic science and the law, some relevant to fire investigations and others addressing diverse subjects relating to the use of forensic science evidence in court.

The presentations are short, so a person attending the annual meeting can glean tidbits from various disciplines and then follow-up to pursue issues of particular interest. For attorneys or others whose job it is to select experts in litigation, the annual meeting provides a good opportunity to evaluate a number of top-notch experts and assess their level of knowledge and presentation skills. There are also good networking opportunities for those trying to connect with professionals in a wide range of forensic disciplines that may pertain to fire investigations. For those wanting to pursue membership, AAFS members and affiliates³¹ belong to one of the 11 Academy Sections, of which the following are most relevant to those involved with fire investigations: "Criminalistics," "Engineering and Applied Sciences," "Jurisprudence" (attorneys and related professions), and "General."

Two further AAFS resources that IAAI members will find useful when researching scientific literature are the JFS³² (a digital subscription is free to AAFS members) and the AAFS Reference Library.³³ Both have searchable databases that can point to papers or presentations relevant to fire investigations and related disciplines.

More information about AAFS, membership, meetings and activities is available at <https://www.aafs.org/>.

7.1. Academy Standards Board

The Academy Standards Board (ASB)³⁴ is an ANSI-approved standards development organization. Our readers will be more familiar with NFPA and ASTM, which are also ANSI-approved standards development organizations. The ASB is new to the standards-making world and is a subsidiary of AAFS created to address specific standardization needs of the national and international forensic communities. The standards being developed by OSAC's Dogs and Sensors Subcommittee are being written in accordance with ANSI-approved ASB procedures for developing consensus standards. Readers are invited to consult the Dogs and Sensors Subcommittee webpage (cited earlier) for more information about its ASB canine standards.

7.2. Forensic Specialties Accreditation Board

At the time of writing this column, the IAAI- CFI® program has two accreditations. One is by the Forensic Specialties Accreditation Board.

Below is a synopsis of the FSAB and its purposes:³⁵

This [accreditation] program is intended to establish a mechanism whereby the forensic community can assess, recognize and monitor organizations or professional boards that certify individual forensic scientists or other forensic specialists (conformity assessment bodies, CABs). This program has been established with the support and grant assistance of the American Academy of Forensic Sciences (AAFS), the National Forensic Science Technology Center (NFSTC) and the National Institute of Justice (NIJ). Certification and accreditation are specific recommendations cited in a 2009 assessment of the forensic sciences, *Strengthening Forensic Science in the United States*, published by the National Academy of Sciences (NAS). View the [FSAB comments](#) on this important NAS report [the *NRC/NAS Report*].

That the IAAI decided to obtain an accreditation for its IAAI- CFI® program by an organization focusing on forensic specialties should be applauded. This is evidence that the IAAI, the leader in the fire investigation community, recognizes the shift of our field into the forensic sciences.

8. Conclusion

This article has served its purpose if, by exploring the activities of the organizations we have described, our readers will be better able to track developments in the forensic sciences that are relevant to fire investigations. In summary, the work products of NCFS are readily available online and make very interesting reading for anyone interested in future trends in the forensic sciences, including fire investigations. OSAC has gathered many of the leading experts in most forensic science disciplines and is becoming a major resource for anyone wanting to follow

changes in relevant industry standards. A good starting point is to explore the webpages of the four subcommittees listed in section 4 above.

Finally, the IAAI has entered into a relationship with the AAFS enabling IAAI members to attend the AAFS Annual Scientific Meeting at reduced registration rates. This provides what is effectively a buffet of presentations to sample for a reasonable price dealing with fire investigations from the perspectives of diverse forensic science disciplines.

While all of this information concerning other forensic science disciplines and their standards may seem overwhelming at first, this is to be expected in the beginning stages of a time of significant change. Just as the fire investigation community struggled when the widespread effects of the *Daubert* decision were first realized, we may experience a similar upheaval associated with the entry of fire investigations into the forensic sciences. However, the earlier our readers can begin to familiarize themselves with the organizations and the information described in this article, the sooner they will begin to adapt. The hope is that in the end, fire investigations will be better for this transition.

9. Acknowledgements

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ENDNOTES

1. In this context, we are using the term "standards" generically. When used in a generic sense, NFPA 921, 2017 ed., s. 3.2.5 states that the term "standards" includes all NFPA Standards, including Codes, Standards, Recommended Practices, and Guides. OSAC also refers generically to "standards," using the name "OSAC Registry Approved Standards" to include standards and guidelines. See Nat'l. INSTITUTE OF STANDARDS AND TECHNOLOGY, FORENSIC SCIENCE, *OSAC Registry Approved Standards*, <https://www.nist.gov/topics/organization-scientific-area-committees-forensic-science/osac-registry-approved-standards/> (updated Dec. 3, 2019). Both the NFPA 1033 Standard and the NFPA 921 Guide are listed in as "OSAC Registry Approved Standards."
2. Nat'l. INSTITUTE OF STANDARDS AND TECHNOLOGY, FORENSIC SCIENCE, *NIST Announces Plans for OSAC 2.0: Changes to Forensic Science Organization will Streamline Standards Approval Process*, (Sept. 17, 2019) <https://www.nist.gov/news-events/news/2019/09/nist-announces-plans-osac-20>.
3. 509 U.S. 579, 113 S.Ct. 2786, 125 L.Ed. 2d 469 (1993).
4. INT'L ASSOC. FIRE INVESTIGATORS, *Certified Fire Investigator (IAAI-CFI®)* webpage, <https://www.firearson.com/Training-Credentials/Certifications-Designations/Certified-Fire-Investigator-IAAICFI/Default.aspx> (last visited Dec. 13, 2019).
5. *Id.*
6. COMM. ON IDENTIFYING THE NEEDS OF THE FORENSIC SCI. CMTY. ET AL., Nat'l. RESEARCH COUNCIL OF THE Nat'l. ACADEMIES, *STRENGTHENING FORENSIC SCIENCE IN THE UNITED STATES: A PATH FORWARD* (2009), available at <https://www.ncjrs.gov/pdffiles1/nij/grants/228091.pdf> [hereinafter *NRC/NAS Report*].
7. See, e.g., TD Hewitt & W. J. McKenna, *FISC Bulletin Board - Implementing the NRC/NAS Report: Introducing The National Commission on Forensic Science and The Organization of Scientific Area Committees*, *Fire and Arson Investigator J.*, Vol. 66, No. 4, 40 (April 2016); T.D. Hewitt & W. J. McKenna, *FISC Bulletin Board - Experts Beware: Are Your Foundations Open to Attack?*, Vol. 67 *FIRE AND ARSON INVESTIGATOR J.*, Vol. 67, No. 3, 30, (Jan. 2017). These and other FISC Bulletin Board Articles are available to IAAI members at the IAAI website (sign-on required). Go to the IAAI website at <https://www.firearson.com/>; click the "Publications & Resources" tab; and then scroll down and click the "Fire & Arson Investigator Journal" link.
8. NRC/NAS REPORT, *supra* note 7, at 172-173 (emphasis added).
9. See "Experts Beware: Are Your Foundations Open to Attack?," *supra* note 2, sec. 4.
10. U.S. Dept. of Justice, Nat'l. COMM. ON FORENSIC SCI., *Home*, <https://www.justice.gov/archives/nctf> (last visited Dec. 12, 2019).
11. ACCREDITATION AND PROFICIENCY TESTING SUBCOMMITTEE OF THE Nat'l. COMM. ON FORENSIC SCI., *Recommendation on Universal Accreditation (Adopted at NCFIS Meeting #8 - April 30 - May 1, 2015) RECONCILED at NCFIS Meeting #9 - March 21-22, 2016*, <https://www.justice.gov/archives/nctf/file/477851/download>. For more information on the potential impact of this Universal Accreditation recommendation on fire investigators, see T.D. Hewitt & W. J. McKenna, *FISC Bulletin Board - Trending: Universal Accreditation for Public and Private Fire Investigation Service Providers*, *FIRE & ARSON INVESTIGATOR JOURNAL*, vol. 65 no. 4, p. 33, available at: <https://www.firearson.com/uploads/FAI-2015/FAI-April2015.pdf> (IAAI member sign-in required).
12. *Id.*
13. INTERIM SOLUTIONS SUBCOMMITTEE OF THE Nat'l. COMM. ON FORENSIC SCI., *Views on Defining Forensic Science and Related Terms (Adopted at NCFIS Meeting #6 - April 30 - May 1, 2015) (Correction added by the NCFIS Feb. 2016)*, <https://www.justice.gov/archives/nctf/file/798571/download>.
14. Nat'l. COMM. ON FORENSIC SCI., *Reflecting Back - Looking Toward the Future* (April 17, 2017), available at <https://www.justice.gov/archives/nctf/page/file/959356/download>.
15. FORENSIC SCIENCES STANDARDS BOARD, *OSAC Charter and Bylaws*, s. 1.1 "Mission Statement," (September 28, 2019, version 1.6) available at https://www.nist.gov/system/files/documents/2019/11/13/fssb_osac_charter_and_bylaws_v_1.6_final.pdf
16. FORENSIC SCIENCES STANDARDS BOARD, *OSAC Charter and Bylaws*, s. 1.2 "Aims," (September 26, 2019, version 1.6) available at https://www.nist.gov/system/files/documents/2019/11/13/fssb_osac_charter_and_bylaws_v_1.6_final.pdf
17. John M. Butler, *The National Commission on Forensic Science and the Organization of Scientific Area Committees*, Proceedings of the International Symposium on Human Identification (2014), at 1, available at <http://www.promega.com/products/pfm/genetic-identity/isih-conference-proceedings/proceedings-index-home/>.
18. ORG. OF SCIENTIFIC AREA COMMITTEES, *OSAC Newsletter* (Oct. 2016) available at <https://www.nist.gov/topics/organization-scientific-area-committees-forensic-science/osac-newsletter-october-2016>. The newsletter states, "NFPA921 [2014 ed.] is the first guideline to be posted to the Registry, a list of high-quality, science-based standards and guidelines for forensic practice." Also see OSAC Registry Approved Standards, available at <https://www.nist.gov/topics/organization-scientific-area-committees-forensic-science/osac-registry-approved-standards> (last visited Dec. 14, 2019). The effective date of each standard's addition to the Registry is noted. NFPA 1033, 2014 ed. was added to the registry effective Dec. 22, 2016 and NFPA 921, 2017 ed. was added effective Nov. 1, 2017.
19. Nat'l. INSTITUTE OF STANDARDS AND TECHNOLOGY, FORENSIC SCIENCE - ORG. OF SCIENTIFIC AREA COMMS., *Overview of OSAC's Structure*, available at <https://www.nist.gov/topics/organization-scientific-area-committees-forensic-science/organizational-structure> (updated May 17, 2019).
20. Nat'l. INSTITUTE OF STANDARDS AND TECHNOLOGY, FORENSIC SCIENCE - ORG. OF SCIENTIFIC AREA COMMS., *OSAC 2.0: Updating Structure and Streamlining Processes*, (Sept. 17, 2019) available at <https://www.nist.gov/news-events/news/2019/09/osac-20-updating-structure-and-streamlining-processes>. For information on OSAC's interdisciplinary projects as of December 2019, see its *Interdisciplinary Activities* webpage available at <https://www.nist.gov/topics/organization-scientific-area-committees-forensic-science/interdisciplinary-activities>.
21. *Id.*
22. ORG. OF SCIENTIFIC AREA COMMS., *OSAC Lexicon*, <http://lexicon.forensicosac.org/Term/Home/Index>.
23. ORG. OF SCIENTIFIC AREA COMMS., *OSAC Lexicon Introductory Video*, available at <https://youtu.be/2yjthM53nI>.
24. AMERICAN ACADEMY OF FORENSIC SCIENCES, *Membership*, <https://www.aafs.org/home-page/membership/> (last visited Dec. 14, 2019).
25. AMERICAN ACADEMY OF FORENSIC SCIENCES, *Home*, <https://www.aafs.org/> (last visited Dec. 12, 2019).
26. *Id.*
27. AAFS membership is divided into eleven sections spanning the forensic sciences. Membership also consists of a number of categories. Entry level categories are Student Affiliate, Trainee Affiliate, and Associate Member. Each person applying for membership in the AAFS must satisfy basic membership requirements as well as the prerequisites for entering one of the eleven sections. Upon fulfilling further requirements, a person may apply for promotion to the categories of member or fellow. For more information, see the *AAFS Membership* pages available at <https://www.aafs.org/home-page/membership/>.
28. AMERICAN ACADEMY OF FORENSIC SCIENCES, *Meetings - 2020 Annual Scientific Meeting*, <https://www.aafs.org/home-page/meetings/2020-aafs-annual-scientific-meeting/> (last visited Dec. 12, 2019).
29. AMERICAN ACADEMY OF FORENSIC SCIENCES, *Meetings - 2020 Annual Scientific Meeting*, <https://www.aafs.org/home-page/meetings/2020-aafs-annual-scientific-meeting/registration-information/> (last visited Dec. 12, 2019). The pre-registration deadline for the Feb. 17-22, 2019 meeting at the Anaheim Convention Center in Anaheim, CA is Jan. 20, 2019. The 2021 AAFS Annual Meeting will be held Feb. 15-20 in Houston, TX.
30. MERRIAM WEBSTER DICTIONARY, www.merriam-webster.com.
31. *Supra* note 26.
32. General Public Searchable Index of JFS 1981 - 2005 (An AAFS - ASTM joint project) and Tables of Contents for issues from 1997- 2005 (via ASTM). AAFS Fellows, Members & Affiliates: Go to *JFS Online* (January 2006 issue to present). Once you are logged in, click on the "Open JFS Site" link under your AAFS Web Account Information.
33. AMERICAN ACADEMY OF FORENSIC SCIENCES, *AAFS Reference Library Search Page*, https://webdata.aafs.org/RefLibrary/Ref_Search/Search.aspx.
34. ACADEMY STANDARDS BOARD, *Home*, <https://www.asbstandardsboard.org/>.
35. FORENSIC SPECIALTIES ACCREDITATION BOARD, *Home*, <http://thefsab.org/>.