Updates on Biology SAC, NCFS, and Recent NIST Activities

John M. Butler, Ph.D.
National Institute of Standards and Technology
NIST Fellow & Special Assistant to the Director for Forensic Science
Vice-Chair, National Commission on Forensic Science
Member, OSAC Biology/DNA Scientific Area Committee
OSAC Liaison to SWGDAM
Associate Editor, *Forensic Science International: Genetics*
NIST Forensic Science Efforts

National Commission on Forensic Science (NCFS)
Department of Justice FACA co-led by NIST setting policy

Organization of Scientific Area Committees (OSAC)
NIST-administered
>540 members of the community establishing standards and best practices

NIST Funded Internal Research Programs
~$7.5M/year invested

NIST Forensic Science Center of Excellence
CoE: ~$4M/year invested for 5 years (2015-2020)

International Symposium on Forensic Science Error Management
432 participants (11 countries)
NIST Research Efforts to Aid Forensic Science

SIX CURRENT FUNDED FOCUS AREAS

1. Ballistics and Associated Tool Marks
2. Digital and Identification Forensics
3. Forensic Genetics (DNA)
4. Toxins
5. Trace
6. Statistics

Internal NIST research will be supplemented by a new NIST Forensic Science Center of Excellence (FSCOE)

http://www.nist.gov/forensics
CSAFE will focus on the following objectives:

- Bring together forensic practitioners and expert statisticians to **develop and apply statistical methods** to: latent prints, ballistics, tire marks, footwear, handwriting, bloodstain pattern, tool marks, computer and information systems, mobile devices, network traffic, social media, and GPS

- **Develop**, in collaboration with NIST scientists, **new methods for forensic evidence**

- Develop new inference techniques that account for various sources of uncertainty

- **Establish a sound base of interpretation for forensic evidence** in judicial settings

- **Educate and train forensic practitioners, judges and attorneys**, and the next generation of statisticians
Follow-up to Highly Successful **First** International Symposium on Forensic Science Error Management (July 21-24, 2015)

- **Proceedings being finalized**
  - plan to have out before Feb 2016

- **Website:**
  - [http://www.nist.gov/director/international_forensics_home.cfm](http://www.nist.gov/director/international_forensics_home.cfm)
  - Talk slide PDFs
    (85 available with 2767 slides):
  - Recorded Keynote and Plenary Talks
    (7 videos):
    [http://www.nist.gov/director/recorded_symposium_sessions.cfm](http://www.nist.gov/director/recorded_symposium_sessions.cfm)

- Discussing potential 2\(^{nd}\) meeting in May 2017 (stay tuned)
U.S. initiatives to strengthen forensic science & international standards in forensic DNA

John M. Butler*
National Institute of Standards and Technology, Gaithersburg, MD, USA

• This review article covers recent U.S. activities to strengthen forensic science including the formation of the National Commission on Forensic Science and the Organization of Scientific Area Committees

• DNA documentary standards and guidelines from organizations around the world are also included

Butler, J.M. (2015) U.S. initiatives to strengthen forensic science & international standards in forensic DNA. FSI Genetics (volume 18, pp. 4-20)
A Renewal MOU Was Recently Signed between DOJ and NIST and is publicly available on the NCFS website.


X. Signatures:

For the Department of Justice:

Signature:

Date: 4 August 2015

For the National Institute of Standards and Technology:

Signature:

Date: 05 August 2015
Organization of Scientific Area Committees (OSAC)

Forensic discipline-specific “guidance groups” administered by NIST

http://www.nist.gov/forensics/osac/index.cfm
Organization of Scientific Area Committees (OSAC)

Forensic Science Standards Board (FSSB)

Legal Resource Committee (LRC)

Quality Infrastructure Committee (QIC)

Human Factors Committee (HFC)

Biology/DNA SAC
- Biological Data Interpretation and Reporting Sub
- Biological Methods Sub
- Wildlife Forensics Sub

Chemistry/Instrumental Analysis SAC
- Fire Debris and Explosives Sub
- Geological Materials Sub
- Gunshot Residue Sub
- Materials (Trace) Sub
- Seized Drugs Sub
- Toxicology Sub

Crime Scene/Death Investigation SAC
- Anthropology Sub
- Disaster Victim Identification Sub
- Dogs and Sensors Sub
- Fire and Explosion Investigation Sub
- Medicolegal Death Investigation Sub
- Odontology Sub
- Crime Scene Sub

Digital/Multimedia SAC
- Digital Evidence Sub
- Facial Identification Sub
- Speaker Recognition Sub
- Video/Imaging Technology and Analysis Sub

Physics/Pattern Interpretation SAC
- Bloodstain Pattern Analysis Sub
- Firearms and Toolmarks Sub
- Footwear and Tire Sub
- Forensic Document Examination Sub
- Friction Ridge Sub

Currently 542 total members

14 of 26 are ASTM standards

364 active projects

14 of 26 are ASTM standards

Added Dec 2015

SAC = Scientific Area Committee
Sub = Subcommittee
**SAC Biology Membership and Initial Terms (2, 3, or 4 years)**

<table>
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<tr>
<th>Members (Term)</th>
<th>Role</th>
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</thead>
<tbody>
<tr>
<td>George Herrin (4)</td>
<td>Chair</td>
</tr>
<tr>
<td>Angelo Della Manna (3)</td>
<td>Vice-Chair</td>
</tr>
<tr>
<td>DeeDee Hawk (2)</td>
<td>Exec Sec</td>
</tr>
<tr>
<td>Kim Murga (2)</td>
<td>SC Chair</td>
</tr>
<tr>
<td>Robyn Ragsdale (4)</td>
<td>SC Chair</td>
</tr>
<tr>
<td>Kathy Moore (2)</td>
<td>SC Chair</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Members (Term)</th>
<th>Role</th>
</tr>
</thead>
<tbody>
<tr>
<td>John Butler (3)</td>
<td>QIC Liaison, SWGDAM Liaison</td>
</tr>
<tr>
<td>Tom Callaghan (3)</td>
<td></td>
</tr>
<tr>
<td>Robin Cotton (4)</td>
<td>LRC Liaison</td>
</tr>
<tr>
<td>Phillip Danielson (4)</td>
<td>HFC Liaison</td>
</tr>
<tr>
<td>Bruce Weir (3)</td>
<td></td>
</tr>
<tr>
<td>Simone Gittelston (2)</td>
<td></td>
</tr>
</tbody>
</table>

First public SAC meeting was held **February 16, 2015 7-10pm** at the AAFS meeting

Monthly conference calls are conducted to get subcommittee updates

Second public SAC meeting was **October 15, 2015 7:30-8:45am** at the ISHI meeting

Next public SAC meeting will be **February 22, 2016 10:15am-12pm** at AAFS meeting
Biology/DNA
Scientific Area Committee

George Herrin (chair)

3 SWGDAM participants

Not pictured: Bruce Weir & Simone Gittelson

Message to SWGDAM from George Herrin (SAC Biology Chair)

- We are very close to pushing 4-5 documents out of the various subcommittees and up to the SAC for a vote at the end of the month in Leesburg.
- I would like to have the SAC work collaboratively with SWGDAM as they get closer to finalizing the next revision of QAS so that we can avoid potential conflicts.
- We will be sending notice of the documents to all TL and SWGDAM members after the SAC has reviewed and decided to move forward with them.
- I appreciate the contributions of those members of SWGDAM who are also serving as OSAC subcommittee members or affiliates.

From email to John Butler (13 Jan 2016)
## OSAC Forensic Biology Glossary

*(Terminology) Document Under Review*

### Standard Forensic Biology / DNA Glossary

November 2015

http://media.wix.com/ugd/4344b0_da25419ba2dd4363bc4e5e8fe7025882.pdf

Interpretation Guidelines for Autosomal STR Typing: http://media.wix.com/ugd/4344b0_61b46a0e1a4c411cc65f719a533b8e29.pdf

Validation Guidelines for DNA Analysis Methods: http://media.wix.com/ugd/4344b0_cbc27d16dcb64fd88cb36ab2a2e25e4c.pdf


### Reference to SWGDAM documents is provided

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
<th>Source</th>
<th>Document</th>
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<tbody>
<tr>
<td>Accredited Laboratory</td>
<td>A DNA laboratory that has received formal recognition that it meets or exceeds a list of standards, including the FBI Director’s Quality Assurance Standards, to perform specific tests, by a nonprofit professional association of persons actively involved in forensic science that is nationally recognized within the forensic community in accordance with the provisions of the Federal DNA Identification Act (42 U.S.C. § 14132) or subsequent laws.</td>
<td>QAS</td>
<td></td>
</tr>
<tr>
<td>Accuracy</td>
<td>The degree of conformity of a measured quantity to its actual (true) value.</td>
<td>QAS; SWGDAM</td>
<td>Validation Guidelines for Forensic DNA Analysis Methods</td>
</tr>
<tr>
<td>Additional Amplification Cycles</td>
<td>One or more amplification cycles beyond what the laboratory had validated in the Standard Method of its STR kit.</td>
<td>SWGDAM - Modified by OSAC terminology</td>
<td>Guidelines for STR Enhanced Detection Methods</td>
</tr>
</tbody>
</table>
OSAC Biology/DNA SAC Summary

- **Regular conference calls (virtual meetings)**
  - SAC and subcommittees each meet at least monthly
  - Task groups meet sometimes multiple times per month

- A public SAC meeting/public comment session was held as part of the ISHI meeting in Grapevine, Texas on October 15, 2015

- The next public SAC meeting is February 22, 2015 as part of the AAFS meeting in Las Vegas, Nevada

- Several documents are close to being completed for submission to a Standards Developing Organization (SDO)

- AAFS is standing up an SDO; the current plan is to use this route for SAC Biology/DNA documents
No documents reside on the OSAC Registry of Standards or Registry of Guidelines yet
OSAC Quality Infrastructure Committee (QIC) has developed worksheets for documenting efforts.
Upcoming OSAC Events

- **January 25-29, 2016** – Second in-person meeting of OSAC subcommittees (Leesburg, VA)

- **February 22-23, 2016** – Second public meeting with presentations by SAC and subcommittee chairs in Las Vegas, NV as part of AAFS

January 2016 – first posting to OSAC Registry of Approved Standards (anticipated for 5 documents that have been out for public comment)
One of the ways to solicit public comment on standards and guidelines up for consideration on the OSAC Registries

http://nist.gov/forensics/osac/osac-newsletter.cfm
Based on current funding
OSAC in-person meetings are on a ~9 month cycle
(January – July/August – April – January …)

Internal OSAC Meetings
(Leesburg, VA) – January 25-29, 2016

• (Jan 25) FSSB meeting
• (Jan 26) 5 SACs, 3 Resource Committees & several subcommittees
• (Jan 27) full OSAC plenary followed by 24 SCs, 3 RC meetings
• (Jan 28) 24 SCs, 3 RC meetings
• (Jan 29) ½ day 24 SCs
Public OSAC Meetings (at AAFS, Las Vegas, NV)

February 22, 2016 (Monday)
(8 am – 10 am) Digital/Multimedia SAC
• Digital Evidence
• Facial Identification
• Video/Imaging Technology and Analysis
• Speaker Recognition

(10:15 am – 12 pm) Biology/DNA SAC
• Biological Methods
• Biological Data Interpretation & Reporting
• Wildlife Forensics

(1 pm – 5 pm) Crime Scene/Death Investigation SAC
• Anthropology
• Disaster Victim Identification
• Dogs and Sensors
• Fire and Explosion
• Medicolegal Death Investigation
• Odontology

February 23, 2016 (Tuesday)
(8:30 am – 12 pm) Physics/Pattern Interpretation SAC
• Bloodstain Pattern Analysis
• Firearms and Toolmarks
• Footwear and Tire
• Forensic Document Examination
• Friction Ridge

(1 pm – 5 pm) Chemistry/Instrumental Analysis SAC
• Fire Debris and Explosives
• Geological Materials
• Gunshot Residue
• Materials (Trace)
• Seized Drugs
• Toxicology

5 SAC chairs and 24 subcommittee chairs will present; will be webcast
NCFS Leadership

Sally Q. Yates
Deputy Attorney General
DOJ Co-Chair

Willie E. May
Director of NIST
NIST Co-Chair

Nelson A. Santos
Vice-Chair (DOJ)

John M. Butler
Vice-Chair (NIST)

32 voting and 8 ex-officio members

Last meeting (8th): Dec 7-8, 2015
Next meeting (9th): March 21-22, 2016
New Commissioners for Second Term

1. Thomas D. Albright, Ph.D., Professor and Conrad T. Prebys Chair, The Salk Institute for Biological Studies, La Jolla, California

2. Arturo Casadevall, M.D., Ph.D., Bloomberg Distinguished Professor and Alfred and Jill Summer Professor and Chair of Molecular Microbiology and Immunology, Bloomberg School of Public Health, Johns Hopkins University, Baltimore, Maryland

3. Gregory C. Champagne, Sheriff, St. Charles Parish, Louisiana

Will be looking for a new digital evidence member...

5. Deirdre M. Daly, United States Attorney for the District of Connecticut

6. Sunita Sah, M.D., Ph.D., Assistant Professor of Management and Organizations, Johnson Graduate School of Management, Cornell University, Ithaca, New York

Current NCFS Subcommittees

http://www.justice.gov/ncfs/subcommittees

where much of the Commission work occurs...

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<th>NCFS Subcommittee</th>
<th># Commissioners</th>
<th># Non-Commissioners</th>
</tr>
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<td>1. Accreditation &amp; Proficiency Testing</td>
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<td>2. Human Factors</td>
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<td>16</td>
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<td>3. Interim Solutions</td>
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<tr>
<td>4. Medicolegal Death Investigation</td>
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<td>7</td>
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<tr>
<td>5. Reporting &amp; Testimony</td>
<td>13</td>
<td>9</td>
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<tr>
<td>6. Scientific Inquiry &amp; Research</td>
<td>12</td>
<td>5</td>
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<tr>
<td>7. Training on Science &amp; Law</td>
<td>7</td>
<td>5</td>
</tr>
</tbody>
</table>

Most Commissioners are on multiple subcommittees

57 non-Commissioners contributing to the process

Subcommittee products are discussed and voted on by the full Commission prior to being recommended to the Attorney General
Timeline for Commission Activities

Federal Advisory Committees exist on a 2-year renewal cycle

New Commission charter signed on April 23, 2015
Includes digital evidence

While we hope that a new charter will be signed in April 2017 extending the NCFS, a new administration will begin January 20, 2017 and may have different priorities

- Announcement at AAFS 2013 meeting (February 21, 2013)
- Commission charter filed (April 23, 2013)
- Commission membership named (January 10, 2014)

Term 1 (April 23, 2013 – April 23, 2015):
- First meeting (February 3-4, 2014)
- Second meeting (May 12-13, 2014)
- Third meeting (August 26-27, 2014)
- Fourth meeting (October 28-29, 2014)
- Fifth meeting (January 29-30, 2015)

Term 2 (April 23, 2015 – April 23, 2017):
- Sixth meeting (April 30-May 1, 2015)
- Seventh meeting (August 10-11, 2015)
- Eighth meeting (December 7-8, 2015)
- Ninth meeting (March 21-22, 2016)
- Tenth meeting (June 20-21, 2016)
- Eleventh meeting (Sept 12-13, 2016)
- Twelfth meeting (January 9-10, 2017)
- Thirteenth meeting (April 10-11, 2017)
Commission Meetings Relative to SWGDAM

SWGDAM talk (January 9, 2014)
• Commission membership named (January 10, 2014)
• *First* Commission meeting (February 3-4, 2014)
• *Second* Commission meeting (May 12-13, 2014)

SWGDAM talk (July 17, 2014)
• *Third* Commission meeting (August 26-27, 2014)
• ISHI meeting presentation (October 1, 2014)
• World Forensics Festival talk (October 14, 2014)
• *Fourth* Commission meeting (October 28-29, 2014)

SWGDAM talk (January 15, 2015)
• *Fifth* Commission meeting (January 29-30, 2015)
• *Sixth* Commission meeting (April 30-May 1, 2015)

SWGDAM talk (July 16, 2015)
• *Seventh* Commission meeting (August 10-11, 2015)
• *Eighth* Commission meeting (December 7-8, 2015)

SWGDAM talk (January 14, 2016)
## NCFS Outside Speaker Panel Discussions

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<th>Topics</th>
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<td>Background on NRC 2009 report, 2009 census of public labs, &amp; SoFS efforts</td>
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<tr>
<td>2</td>
<td>Ethics and Forensic Science</td>
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<tr>
<td>2, 3</td>
<td>Cognitive Bias and Human Factors (part 1 &amp; part 2)</td>
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<tr>
<td>3</td>
<td>Latent Print Automated Fingerprint Identification System (AFIS) Interoperability</td>
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<td>3</td>
<td>Role of Accreditation in Forensic Science</td>
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<td>4</td>
<td>Assessing Eyewitness Identification (NRC report)</td>
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<td>5</td>
<td>Documentary Standards</td>
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<td>5</td>
<td>Judicial Training</td>
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<td>5</td>
<td>Accreditation and Certification within the MDI Community</td>
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<td>6</td>
<td>Evidence Preservation and Retention</td>
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<td>6</td>
<td>OSAC Update and Priority Action Report</td>
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<tr>
<td>6</td>
<td>Disaster Victim Identification within the MDI Community</td>
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<tr>
<td>7</td>
<td><strong>Exploring Issues Related to Proficiency Testing</strong></td>
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<tr>
<td>8</td>
<td>Translation of Scientific Research into Forensic Practice</td>
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<tr>
<td>8</td>
<td>AAAS Forensic Science Assessments: A Quality &amp; Gap Analysis</td>
</tr>
</tbody>
</table>
Designated Federal Official (DFO) for the National Commission on Forensic Science

Andrew J. Bruck
Counsel to the Deputy Attorney General
950 Pennsylvania Avenue NW
Washington, DC 20530
Andrew.J.Bruck@usdoj.gov
(202) 305-3481
Subcommittee on Procedures and Operations (SPO) – formerly Bylaws

• **Purpose**: to define/refine process documents and bylaws governing Commission activities

• **SPO Membership**:
  - DFO: Andrew Bruck
  - Vice-Chairs: Nelson Santos & John Butler
  - OSTP representative: Meredith Drosback (replaced Tania Simoncelli)
  - Commission representatives (4):
    - Marilyn Huestis (researcher)
    - Dean Gialamas (practitioner)
    - Pam King (defense attorney → MN district judge)
    - Matt Redle (prosecuting attorney)
Commission Work Products

• The Commission is a Department of Justice Federal Advisory Committee and therefore only has direct authority to make recommendations to the Attorney General.

DOJ has promised to respond to NCFS work products within two meetings

• It is hoped that Commission work products will be considered and adopted by other Federal agencies and within state and local jurisdictions.

Voting is conducted electronically with a two-thirds majority required to pass
The first meeting of the National Commission on Forensic Science was held February 3 - 4, 2014 in Washington, DC. On February 3, the meeting was called to order at 9:00 a.m. The meeting began with communicating administrative, operational, and procedural information to the Commission members. Welcoming remarks were delivered by the co-chairs, Deputy Attorney General James M. Cole and Under Secretary of Commerce for Standards and Technology and NIST Director Patrick D. Gallagher. Dr. John Holdren, Science Advisor to the President and Director of the Office of Science and Technology Policy also provided welcoming remarks to the Commission. The afternoon included presentations from Judge Harry Edwards on reflections from the NRC report on "Strengthening Forensic Science in the United States" and Matt DuRose of the Bureau of Justice Statistics on the Census of Publicly Funded Crime Laboratories. Background presentations on accreditation, certification, proficiency testing, and research were also provided to the Commission. The afternoon closed with a one-hour public.
NCFS Email Updates - GovDelivery

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We Encourage Public Comments

- Individuals wishing to submit written public comment regarding draft work products should do so by going to www.regulations.gov

- Work products are made available to Commissioners and to the general public at least 15 days before the next meeting and public comments can also be provided 15 days after a meeting (30 days total)
NCFS Meeting 7 Topics
August 10-11, 2015

• Subcommittee Reports & Work Product Discussion
  • Five final work products were approved

• Briefing on Ethics and the Special Government Employee

• Panel on Exploring Issues Related to Proficiency Testing
  • Speakers: Brady Mills, Christopher Czyryca, Jesse Brown

• Presentation on The Netherlands Register of Court Experts: Experiences and Challenges toward a Forensic Science Quality System
  • Speaker: Michael Smithuis

NCFS Meeting 8 Topics
December 7-8, 2015

• Subcommittee Reports & Work Product Discussion
  • Three final work products were approved

• OSAC Update
  • Speaker: Jeremy Triplet

• Panel on Translation of Scientific Research into Practice
  • Speakers: Molly Dix (RTI), Fen Zhao (NSF), Peter Marks (FDA), Jennifer Shieh (NIH)

• Presentation on AAAS Forensic Science Assessments
  • Speakers: Mark Frankel and Deborah Runkle

Work Products Adopted by the Commission

1. Survey of Law Enforcement Forensic Units
2. Accreditation of Medical Examiner and Coroner Offices
3. Certification of Medicolegal Death Investigators
4. Scientific Literature in Support of Forensic Science and Practice
5. Inconsistent Terminology
6. **Universal Accreditation**
7. Forensic Science and Related Terms
8. Automated Fingerprint Identification System (AFIS) Interoperability
9. Root Cause Analysis (RCA) in Forensic Science
10. Pretrial Discovery of Forensic Materials
11. Increasing the Number, Retention, and Quality of Board-Certified Forensic Pathologists
12. Electronic Networking of Medical Examiner and Coroner Offices
13. Documentation, Case Record and Report Contents
14. Ensuring that Forensic Analysis is Based Upon Task-Relevant Information
15. Forensic Science Curriculum Development
Justice Department Announces New Accreditation Policies to Advance Forensic Science

Deputy Attorney General Sally Quillian Yates announced today that the Justice Department will, within the next five years, require department-run forensic labs to obtain and maintain accreditation and require all department prosecutors to use accredited labs to process forensic evidence when practicable. Additionally, the department has decided to use its grant funding mechanisms to encourage other labs around the country to pursue accreditation.

The new policies arose out of recommendations made by the National Commission of Forensic Science (NCFS), which was established to advance the field of forensic science and make suggestions to the Attorney General on how to ensure that reliable and scientifically valid evidence is used when solving crimes. The Attorney General made the decision to implement several of the commission’s recommendations last week and the Deputy Attorney General, who serves as co-chair of the NCFS, announced their adoption at a meeting of the commission today.
MEMORANDUM FOR HEADS OF DEPARTMENT COMPONENTS

FROM: Loretta E. Lynch
       Attorney General

SUBJECT: Recommendations of the National Commission on Forensic Science Announcement for NCFS Meeting Eight

Our justice system depends on reliable, scientifically valid evidence. For the past two years, the National Commission on Forensic Science (NCFS) has developed recommendations for how the Department of Justice can strengthen the field of forensic science. The Department is reviewing those recommendations on a rolling basis, and will continue to evaluate proposals as they are approved by the NCFS.
NCFS Work Products – Drafts were open for public comment (Nov 23 – Dec 22, 2015)

Will be voted on at the March 21-22, 2016 NCFS meeting

1. Proficiency Testing in Forensic Science
2. Critical Steps to Accreditation
3. National Code of Professional Responsibility
4. Transparency of Quality Management System Documents
5. Testimony Using the Term “Reasonable Degree of Scientific Certainty”
6. Funding for Post-Doctoral Projects to Facilitate Translation of Research into Forensic Science Practice
7. Establishing the Foundational Literature within the Forensic Science Disciplines
1. Accessibility of Scientific Literature
2. Evaluating the Effectiveness of Scientific Procedures and Practices
3. Validation of Test Methods
4. Role of Accreditation in Forensic Education
5. Training Assessment Tools
6. Training on Notification
7. Assessment of Context Management Systems
8. Checklists to Reduce Bias
9. National Call Center
10. Model Legislation for Medical Examiner and Coroner Jurisdictions
11. Medicolegal Autonomy and Independence
12. Uniform Policies and Procedures for Accreditation Programs
13. Analyst Certification
14. Need for Research to Improve Quality of Proficiency Tests
15. Data Collection and Collaboration with Proficiency Test Providers
16. Accreditation and Digital Evidence
17. Presentation of Expert Testimony
18. Access to Expert Witnesses by Defense
19. Judicial Vouching
20. Notice and Demand Rules
21. Probabilistic Statements
22. Pretrial Discovery
23. Report Content – Case File
24. Evidence Preservation and Retention
NCFS Meeting Dates

• Meeting 8: December 7 – 8, 2015
  • Location: House of Sweden, Washington, DC

FUTURE DATES – LOCATIONS TBD
• Meeting 9: March 21 – 22, 2016
• Meeting 10: June 20 – 21, 2016
• Meeting 11: September 12 – 13, 2016
• Meeting 12: January 9 – 10, 2017
• Meeting 13: April 10 – 11, 2017

CONTINGENT UPON CHARTER RENEWAL
• Meeting 14: July 17 – 18, 2017
• Meeting 15: November 6 – 7, 2017
Other Past and Future NIST Activities
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<td>Molecular approaches for <strong>forensic cell type identification</strong>: on mRNA, miRNA, DNA methylation, and microbial markers</td>
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<td>Manfred Kayser</td>
<td><strong>Forensic DNA phenotyping</strong>: predicting human appearance from crime scene material for investigative purposes</td>
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<td>Chris Phillips</td>
<td>Forensic genetic analysis of <strong>bio-geographical ancestry</strong></td>
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<td><strong>Properties of sperm and seminal fluid</strong>, informed by research on reproduction and contraception</td>
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<td><strong>Rapid PCR of STR markers</strong>: applications to human identification</td>
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<td>Peter Gill et al.</td>
<td><strong>Genotyping and interpretation of STR-DNA</strong>: low-template, mixtures and database matches – 20 years of research and development</td>
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<td>K. Gettings et al.</td>
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<td>Just, Irwin, Parson</td>
<td><strong>Mitochondrial DNA heteroplasmy</strong> in the emerging field of <strong>massively parallel sequencing</strong></td>
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<td>Toni Diegoli</td>
<td>Forensic typing of short tandem repeat markers on the <strong>X and Y chromosomes</strong></td>
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<td>Ogden &amp; Linacre</td>
<td><strong>Wildlife forensic science</strong>: a review of genetic geographic origin assignment</td>
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<td>Maria Brión et al.</td>
<td><strong>Massive parallel sequencing</strong> applied to the <strong>molecular autopsy</strong> in sudden cardiac death in the young</td>
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