A New World of Clues

NIST provides resources to assist Forensic Scientists to Solve Crimes

Susan Ballou, Program Manager For Forensic Sciences, Office of Law Enforcement Standards
Office of Law Enforcement Standards

Weapons and Protective Systems

Ballistic and Stab Resistance of Personal Body Armor
Ballistic Helmets
Development of an NIJ Standard for Bomb Suits
Evaluation Of "Smart Gun" Technologies
Frangible Ammunition Selection Guide and Performance Standard
• Human and Animal Dose Response, Toxicokinetic and Potency Assessment of Pepper Spray Products

• Evaluation of Saliva as an Alternate Drug Testing Specimen

• An Evaluation of Innovative Sweat-Based Drug Testing Techniques for Use in Criminal Justice Drug Testing
• Concealed Weapon Imaging System Development Project
• Electrical Properties of Metals Used in Hand-Held Weapons Evaluation Standards for Still Recognition Systems
• Emergency Vehicle Sirens
NIJ Standardization Efforts Related to Telecommunications and Information Technology (IT) Interoperability
Critical Incident Technologies

- CBRN Respiratory Equipment Standards
  - Personal Protection Equipment (PPE)
  - Detection Equipment
  - Decontamination Equipment
- Support of Domestic Preparedness Programs
Nicole Brown Murder Case (1994)

Crime Scene

Suspect O.J. Simpson
Preserving DNA Evidence

1995: Is *freezing* necessary?

2004: No. Simply maintain *low humidity*.
Short Tandem Repeats (STRs) Database

- Convicted persons required to give blood for genotyping
- Database records to include genetic markers on Y chromosome
- Very effective for identifying perpetrators & closing cases
Short Tandem Repeats (STRs)

STRs are intact, but flanking regions are damaged or deteriorated

Damaged/Deteriorated DNA Samples

STRs are intact, but flanking regions are damaged or deteriorated
miniSTRs

Fluorescent dye label

Dye binding (PCR primer) sites are much closer to the STR

Damaged/Deteriorated DNA Samples
Close proximity of PCR primer sites enhances ability to locate STR
**mtDNA** (mitochondrial DNA)
Characterizes groups of people with common traits

**SNPs** (single nucleotide polymorphisms)
Used to find identifiable pieces of denatured DNA
Useful because SNPs require no repeating bits

**9-11 Investigation**
DNA too damaged for usual ID techniques
SNPs of mtDNA used to identify general characteristics of samples
FIREARM FORENSICS
Standard Reference Material (SRM) for Gunpowder

- Samples with known proportions of propellant (nitroglycerine) and stabilizers (diphenylamine & ethyl centralite)
- Used to calibrate equipment and protocols for characterizing gunpowder samples from crime scenes
- Ensure accuracy and reliability of analyses
National Integrated Ballistics Information Network (NIBIN)

- Firing Pin Mark on Casing
- Ejector Marks on Casing
- Barrel Rifling Marks on Bullet

Firing Pin Mark on Casing

Barrel Rifling Marks on Bullet

Ejector Marks on Casing

National Integrated Ballistics Information Network (NIBIN)
Reference Material (RM)
Standard Bullets & Casings

Phase 1: Manufacture Standard Bullets and Casings

Phase 2: Develop New Algorithm for Comparing Bullet Signatures
Fire Investigation
Burn Characteristics of Materials & Objects

- Burn Characteristics of Materials & Objects
- Sophisticated Computer Modeling

= Simulations & Recreations of Fire Events

Burn Pattern Data for Flammable Liquids
Fire Dynamics Simulator (FDS)

Townhome Fire

World Trade Center

Simulations & Recreations of Fire Events
High-Tech Crime

Child Pornography  Internet Scams
Embezzlement  Identity Theft  Hacking
Drug Smuggling  Money Laundering  Terrorism
Evaluating Forensic Tools - Software and Hardware

- Dozens of hardware configurations
- Effectiveness of “write blockers”
- Identification of problem areas
- Easy-to-use Table of Software and Configurations

www.ojp.usdoj.gov/nij/sciencetech
www.cftt.nist.gov
5900 COTS

45 million hashes in database

Non-English languages included
• “Electronic Crime Scene Investigation” (completed)

• “Forensic Examination of Digital Evidence” (completed)

• “Courtroom Issues” (in review)

• “Construction and Renovation to Handle Digital Evidence” (in review)

• “Investigation Involving the Internet and Computer Networks” (in process)

• “Investigative Uses of High Technology: Devices, Tools and Techniques” (in process)
Background

1998 – National study by NIJ

- Needs to combat electronic crime & terrorism
- Understand aspects of electronic crime
Produced “Top Ten” issues

1. Public awareness
2. Data and reporting
3. Uniform training and certification courses
4. Onsite management assistance for units and task forces
5. Updated laws
Produced “Top Ten” issues

6. Cooperation with the high-tech industry

7. Special research and publications

8. Management awareness and support

9. Investigative and forensic tools

10. Structuring a computer crime unit
NIJ convened a technical working group (TWG) in 1998. Series of guides – topics

- Crime Scene Investigation
- Examination of Digital Evidence
- Construction/Renovation/Management
- Investigation of High Technology Crime
- Investigative Uses of High Technology
- Presentation of Digital Evidence in Court
NIJ TWGs STRUCTURE

- Define the problem
- Prepare meeting timeline
  - Planning Panel 1st meeting
  - Planning Panel + TWG
- 18mo span
- Subject matter experts
  - academia, legal, law enforcement, trainers, developers, analysts
- Obtain Nominations
NIJ TWGs

• **Planning panel**
  • (10-12)
  • Select TWG members
  • Evaluate task
  • Outline chapters
  • Manage subcommittees

• **Technical Working Group (TWG)**
  • (40-45)
  • Subject matter areas represented
  • Divided into subcommittees
NIJ TWGs

• **Scope of Meetings**
  1\textsuperscript{st} – planning panel (pp)
  Set ground rules, develop outline, select other TWG members
  2\textsuperscript{nd} – introduce full TWG
  Break into subcommittees managed by the assigned pp
  3\textsuperscript{rd} – repeat of second meeting
  4\textsuperscript{th} – pp review work to date and edit
  5\textsuperscript{th} – Start TWG review of draft
  Continue till full review of draft complete
NIJ TWGs

• **Final Stage:**

  Final draft is sent out for National review to ~ 100 agencies (fed & non)/industry/academia

  30 day turnaround

  PP reconvene to evaluate comments

  Draft sent to editors - publication
NIJ TWGs

**Budget:**
- Independent meeting site planner
  - ~ $325K yr – 45 participants
- NIST travel/hotel room charges
  - ~ $150K
- Editorial Support
  - ~ $20K onsite/office
  - ~ $12K office only
- Publication
  - ~ dependent upon entity selected
    (Aspen Systems)

Total ~ $500K per guide
**OLES/CSD**

- **OLES**
  - Law Enforcement
  - Forensic Science

- **CSD**
  - Cyber Security
  - Technology

- Courtroom Familiarity
- Legal issues
- Internet Complexities
- Device attributes
OLES/CSD

OLES

Review draft documents from CSD for DHS

Benefit –

– Eliminating duplicate work
– Educated on other expertise at NIST
CSD

Participation on OLES projects

Benefit –

– Learn the TWG “consensus” process
  • Rick Ayers participated
– Provided a view from law enforcement – legal constraints, impact of “a” word
OLES/CSD

Future:
Other TWGs – invite CSD participation

OLES provide courtroom expertise, connection with computer forensic laboratories across the nation

Join forces - federal requests
Many Thanks!!!!!