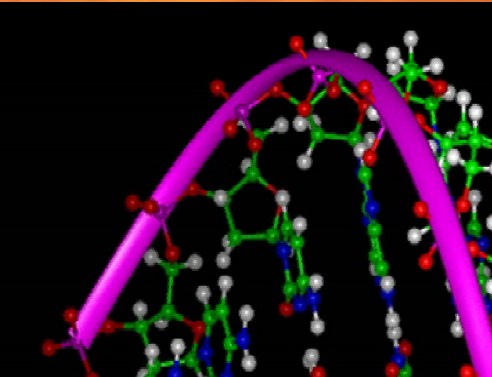


A New World of Clues

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

Chemical Systems and Materials

Detection, Inspection and Enforcement
Technologies

Forensic Sciences

Public Safety Communications Standards

Critical Incident Technologies

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

Office of Law Enforcement Standards



Chemical Systems and Materials

- 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

Office of Law Enforcement Standards



Detection, Inspection and Enforcement Technologies

- **Concealed Weapon Imaging System Development Project**
- **Electrical Properties of Metals Used in Hand-Held Weapons**
- **Evaluation Standards for Still Recognition Systems**
- **Emergency Vehicle Sirens**

Office of Law Enforcement Standards



Public Safety Communications Standards

**NIJ Standardization Efforts Related to
Telecommunications and Information
Technology (IT) Interoperability**

Office of Law Enforcement Standards



Critical Incident Technologies

- **CBRN Respiratory Equipment Standards**

 - Personal Protection Equipment (PPE)

 - Detection Equipment

 - Decontamination Equipment

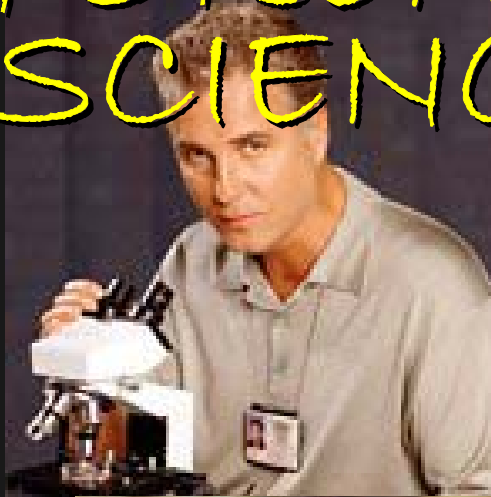
- **Support of Domestic Preparedness Programs**

Office of Law Enforcement Standards



Forensic Sciences

FORENSIC SCIENCE

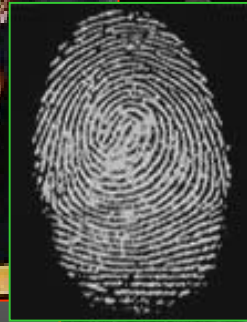
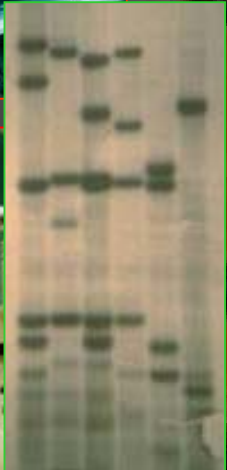
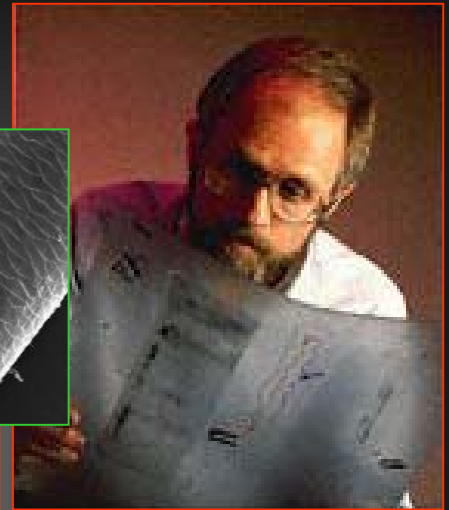
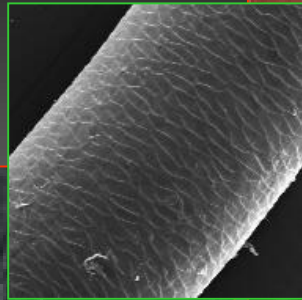


ON CBS

CSI:
Miami

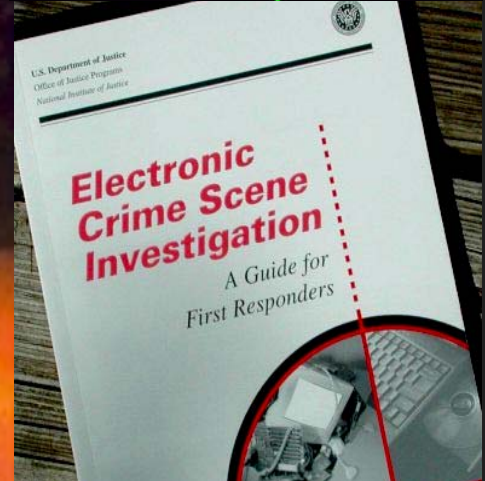
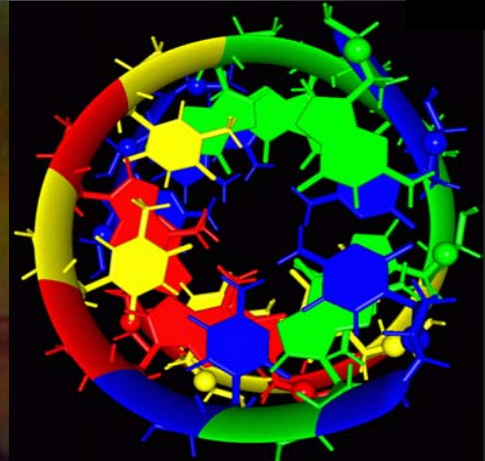


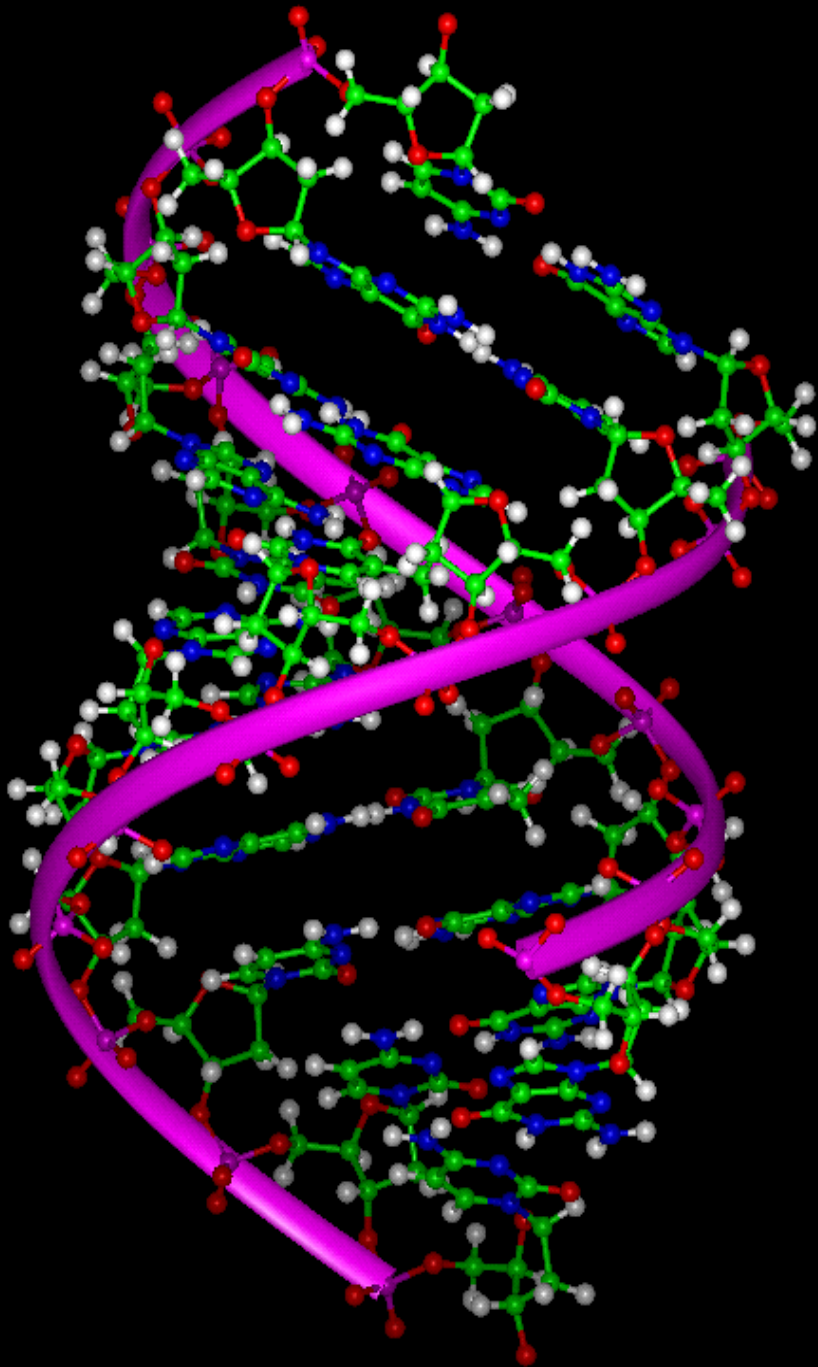
FORENSIC SCIENCE



FORENSIC SCIENCE

at





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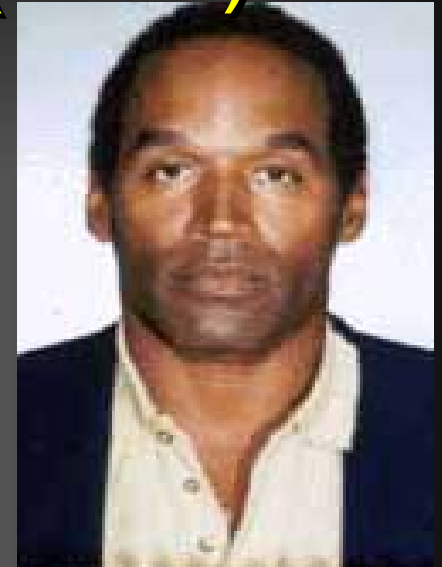
N

A

Nicole Brown Murder Case (1994)



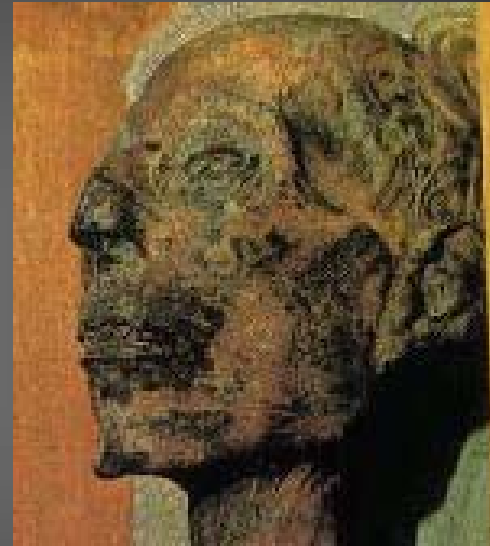
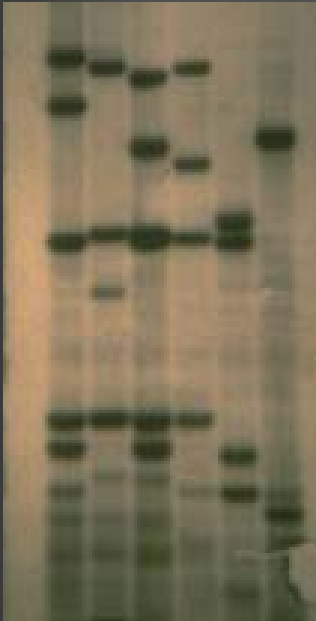
Crime Scene



Suspect O.J. Simpson

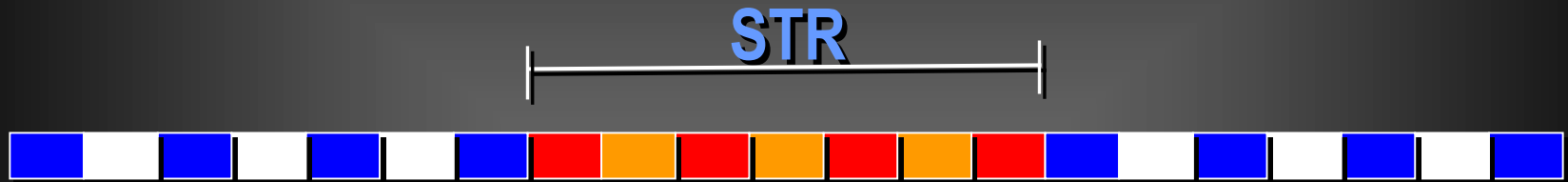
Preserving DNA Evidence

1995: Is *freezing* necessary?



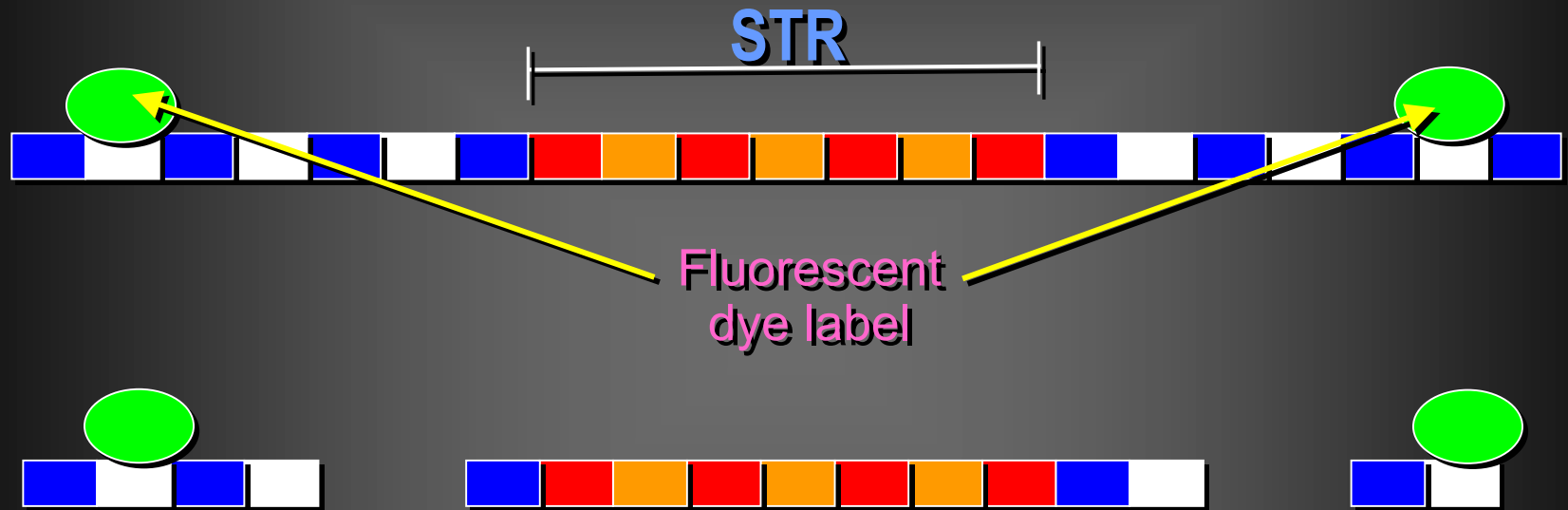
2004: No. Simply maintain **low humidity**.

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)



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

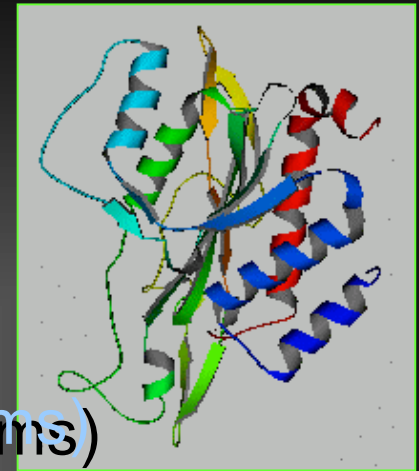
mtDNA (mitochondrial DNA)

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

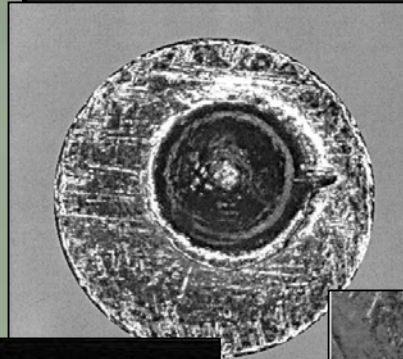
SNPs of mtDNA used to identify general characteristics of samples

FIREARM FORENSICS

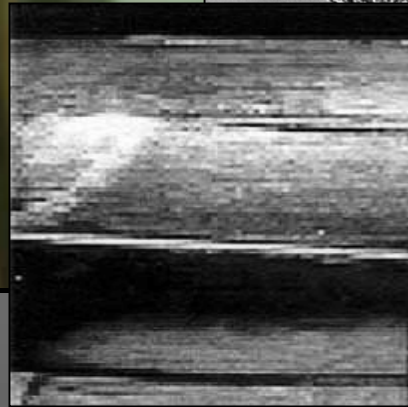


Standard Reference Material (SRM) for Gunpowder

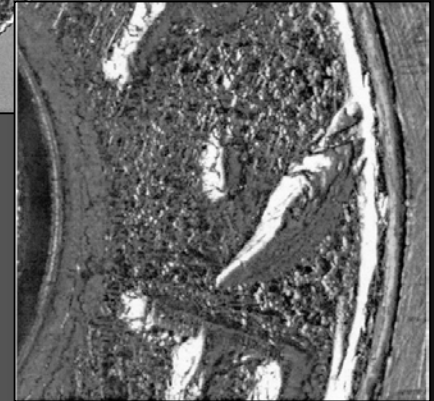
- Samples with known proportions of **propellant** (nitroglycerine) and **stabilizers** (diphenylamine & ethyl centralite)
- Used to calibrate equipment and protocols for characterizing gunpowder samples from crime scenes
- Ensure accuracy and reliability of analyses



Firing Pin Mark
on Casing



Barrel Rifling Marks
on Bullet



Ejector Marks
on Casing



National Integrated Ballistics
Information Network (NIBIN)

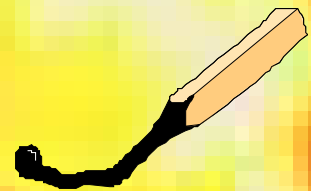
Reference Material (RM) Standard Bullets & Casings



Phase 1: Manufacture Standard Bullets and Casings

Phase 2: Develop New Algorithm for Comparing
Bullet Signatures

Fire Investigation





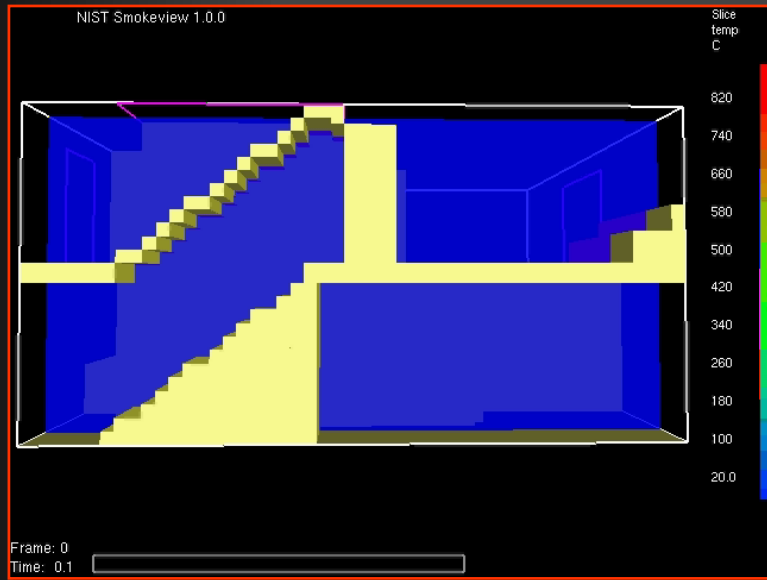
Burn Pattern Data for
Flammable Liquids

+ Burn Characteristics
of Materials & Objects

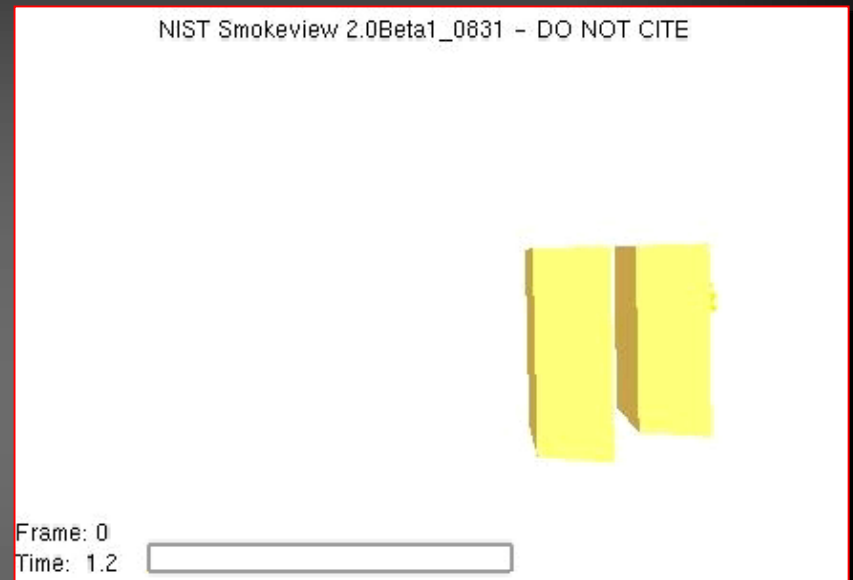
+ Sophisticated Computer
Modeling

= Simulations & Recreations
of Fire Events

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



0010011100010110010101110101101010100101
0101111110010010101000101000100101010101
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100111111001010000101010010100100101001
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1010010110110101100100100101001000101000
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Evaluating Forensic Tools - Software and Hardware

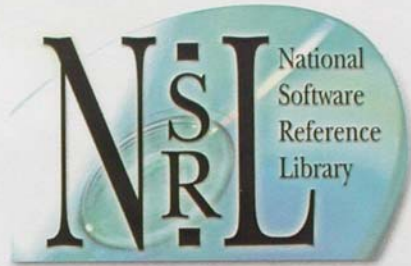
- Dozens of hardware configurations
- Effectiveness of “write blockers”
- Identification of problem areas
- Easy-to-use Table of Software and Configurations

www.ojp.usdoj.gov/nij/sciencetech

www.cftt.nist.gov

00100111000101100101011101011010101001011
01011111100100101010001010001001010101010
01010100010110100101010010010100100001010
1110000000001101010101000010101000010100
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NIST Special Database #28



Reference Data Set

Version 1.2 06/06/2002



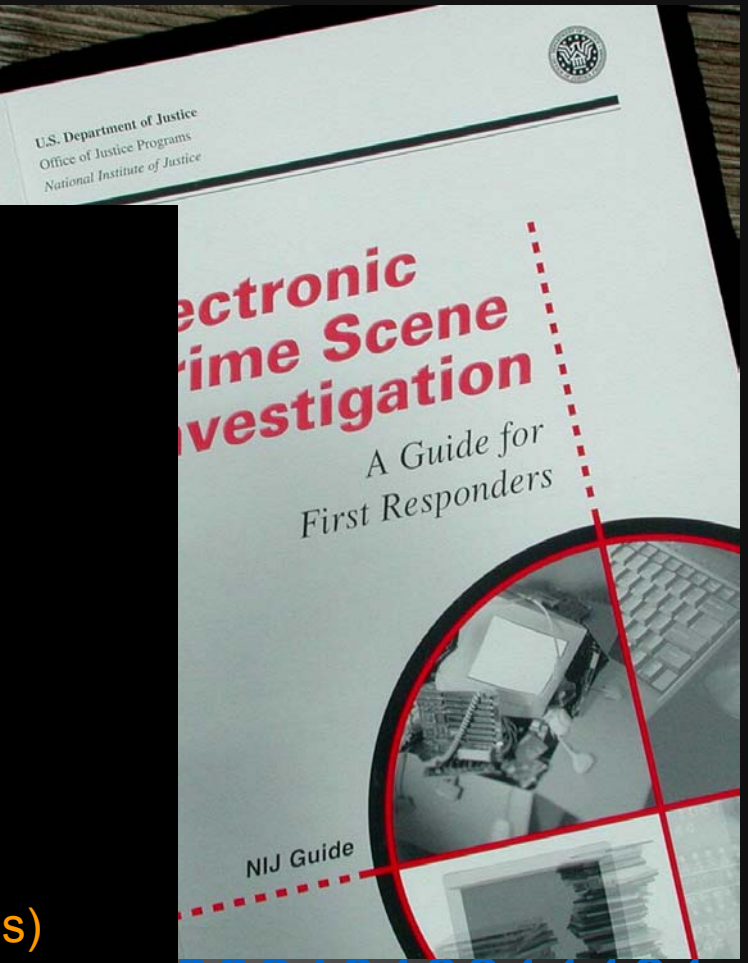
5900
COTS

45 million
hashes in
database

Non-English
languages
included

10011100110

001001110001011001010111
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01011111001001010100010



- **“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)

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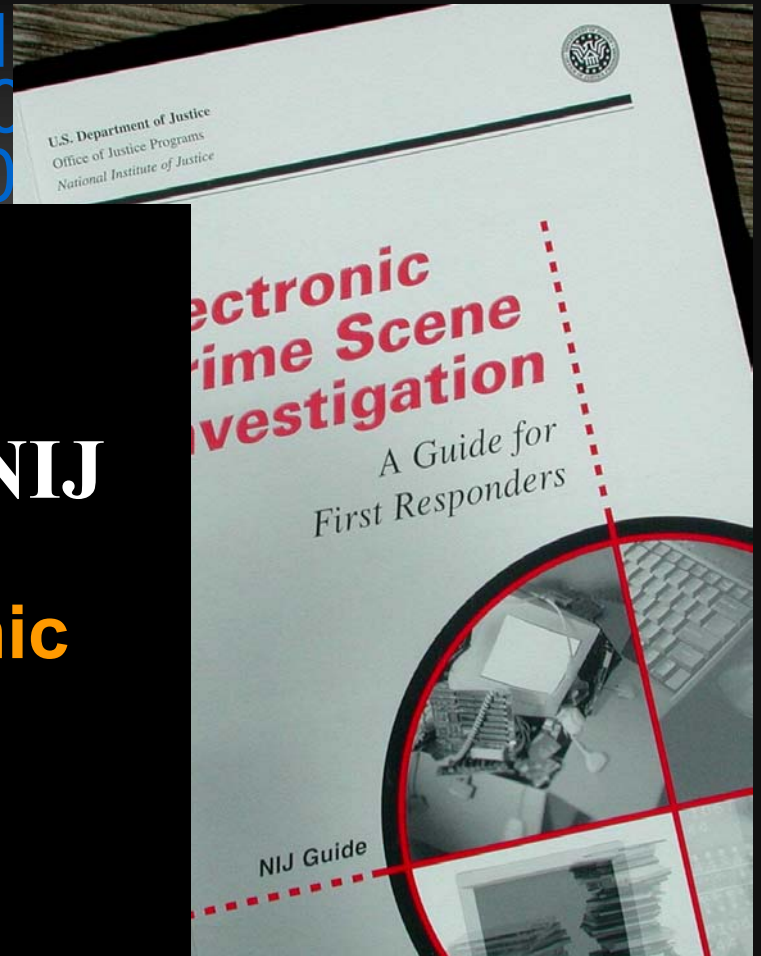
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Background

1998 – National study by NIJ

- Needs to combat electronic crime & terrorism
- Understand aspects of electronic crime

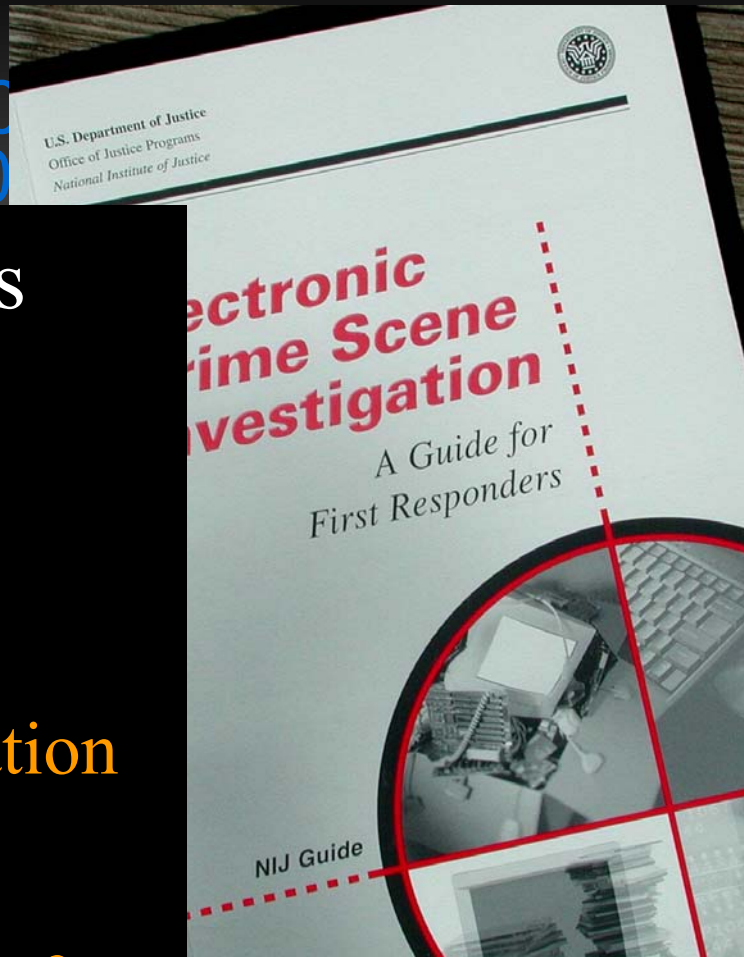


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Produced “Top Ten” issues

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



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Produced “Top Ten” issues

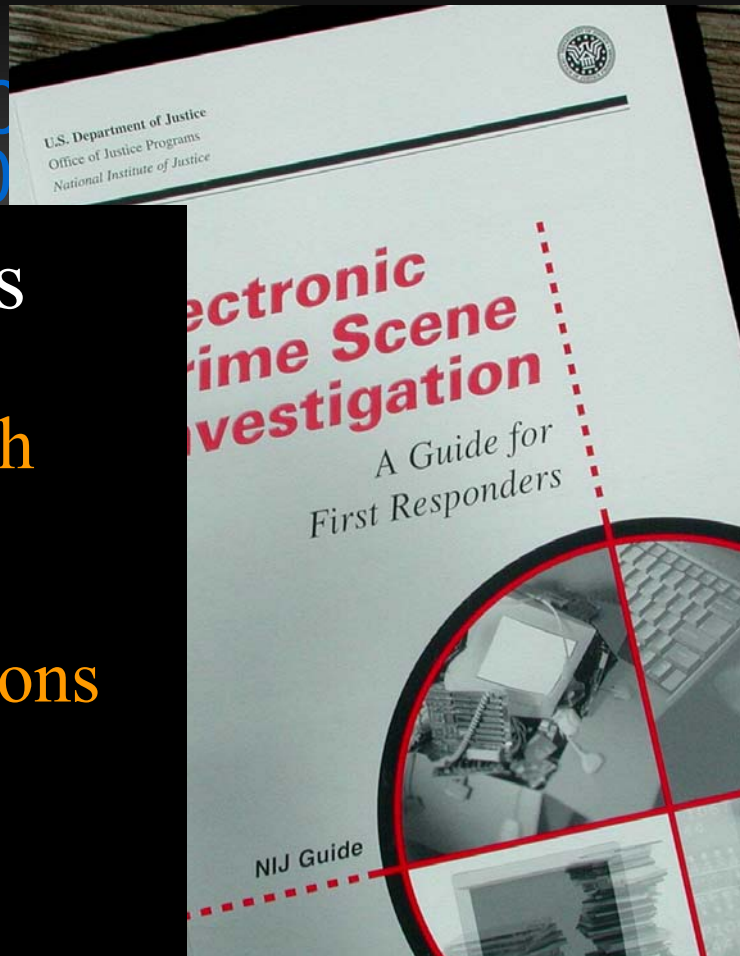
6. Cooperation with the high-tech industry

7. Special research and publications

8. Management awareness and support

9. Investigative and forensic tools

10. Structuring a computer crime unit



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01010100010110100101010010010100100001010

**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

1st – planning panel (pp)

Set ground rules, develop outline,
select other TWG members

2nd – introduce full TWG

Break into subcommittees managed
by the assigned pp

3rd – repeat of second meeting

4th – pp review work to date and edit

5th – 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

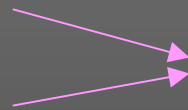
(Aspen Systems)

Total ~ **\$500K** per guide

OLES/CSD

- **OLES**

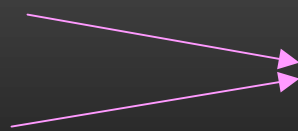
- Law Enforcement
- Forensic Science



Courtroom Familiarity
Legal issues

- **CSD**

- Cyber Security
- Technology



Internet Complexities
Device attributes

OLES/CSD

OLES

Review draft documents from

CSD for DHS

Benefit –

- Eliminating duplicate work

- Educated on other expertise at NIST

OLES/CSD

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!!!!!!