The NIJ Conference
June 21, 2011 – Crystal City, VA

Research Practices Applied to and Born from the World Trade Center Tragedy

Presenter	Institution	Position
John Butler	NIST	Applied Genetics Group Leader
Barbara Butcher	NYC OCME	Chief of Staff
Bradley Adams	NYC OCME	Director of Forensic Anthropology
Elias Kontanis	NTSB	Coordinator for Medicolegal Operations

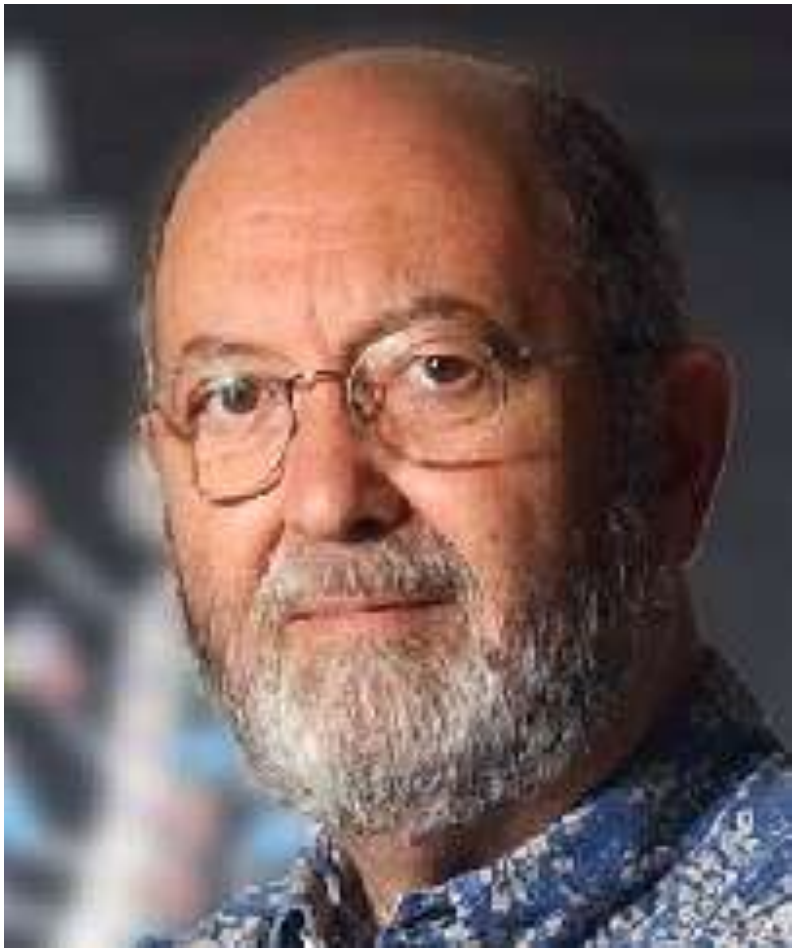
National Institute of Standards and Technology
U.S. Department of Commerce

The NIJ Conference
June 21, 2011 – Crystal City, VA

WTC Kinship and Data Analysis Panel (KADAP) & DNA Technology Innovations

John M. Butler
National Institute of Standards and Technology

Dedication of this Presentation
in Memory of George Carmody



http://http-server.carleton.ca/~gcarmody/images/gcarmody.jpg

March 29, 1938 – June 13, 2011

- Member of WTC KADAP
- Member of Hurricane Katrina Expert Group
- Member of SWGDAM Mixture Committee
- Colleague, fellow teacher, and friend…

We shared co-authorship on an important article that brings us together today…

POLICY FORUM

EPIDEMIOLOGY

DNA Identifications After the 9/11 World Trade Center Attack

Leslie G. Biesecker,* Joan E. Bailey-Wilson, Jack Ballantyne, Howard Baum, Frederick R. Bieber, Charles Brenner, Bruce Budowle, John M. Butler, George Carmody, P. Michael Conneally, Barry Duceman, Arthur Eisenberg, Lisa Forman, Kenneth K. Kidd, Benoît Leclair, Steven Niezgoda, Thomas J. Parsons, Elizabeth Pugh, Robert Shaler, Stephen T. Sherry, Amanda Sozer, Anne Walsh

***Science* (2005) 310: 1122-1123**

Presentation Outline

- WTC Kinship and Data Analysis Panel (KADAP)

- DNA Innovations Applied to WTC Effort
  - **Assays**: **miniSTRs**, SNPs, HT-mtDNA sequencing
  - **Software**: M-FISys, DNA View, MDKAP
  - **Information**: family DNA brochure, sample collection form

- DNA Innovations Born from WTC Effort
  - New assays: miniSTRs (MiniFiler) & new loci
  - Software: OSIRIS
  - Lessons Learned document (NIJ Sept 2006 publication)
    - Family DNA brochure has been used by many states for missing persons programs

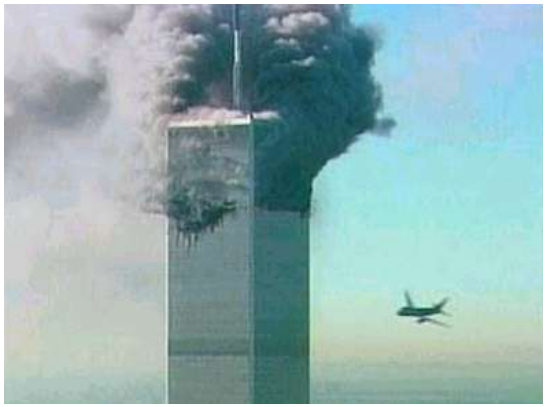
Acknowledgments & Disclaimers

<u>Funding</u>: Interagency Agreement 2008-IJ-R-029 between the National Institute of Justice and NIST Office of Law Enforcement Standards

Points of view are mine and do not necessarily represent the official position or policies of the US Department of Justice or the National Institute of Standards and Technology.

Certain commercial equipment, instruments and materials are identified in order to specify experimental procedures as completely as possible. In no case does such identification imply a recommendation or endorsement by the National Institute of Standards and Technology or the National Institute of Justice nor does it imply that any of the materials, instruments or equipment identified are necessarily the best available for the purpose for which they were used.

Special Circumstances of WTC Samples



Wreckage at Ground Zero

- **Destructive Energy of 9/11/01 Attack**
  - Kinetic energy and fuel load of airplanes
  - Kinetic energy of collapse
- Two Boeing 767 airplanes (fueled with 10,000 gallons each) traveling at 429 to 586 mph
- Two towers 110 floors each, 1362 ft high
- Towers reduced to 70 ft hill, 16 acres, 1.7 million tons debris
- Subterranean fires until December 2001

See also http://wtc.nist.gov

The challenge of an "open" system vs. a "closed" system like an airplane crash

Source: Mecki Prinz (NYC OCME) ISFG presentation, Sept 11, 2003

World Trade Center Victim Identification Efforts

Without DNA

736 Victims Identified

Finished May 2002

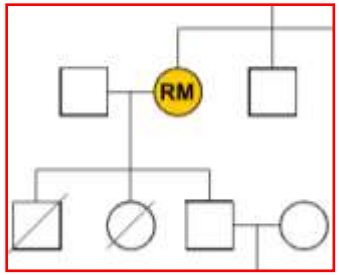
Source: Mecki Prinz (NYC OCME) ISFG presentation, Sept 11, 2003

DNA Analysis Requires Comparisons

(Unknowns are compared to references samples)

Kinship (Indirect) Reference

Biological relatives of victims

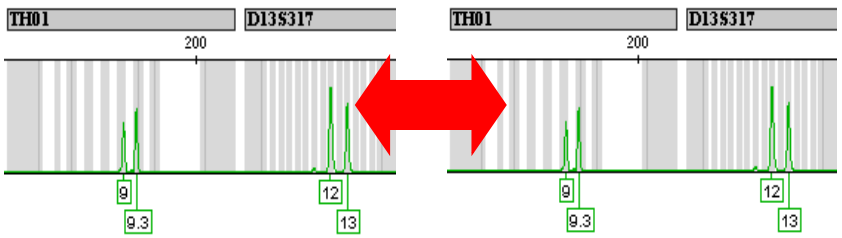


Several family reference samples often required to make an identification

or

Direct Reference

Personal effects of victims



Reference Sample

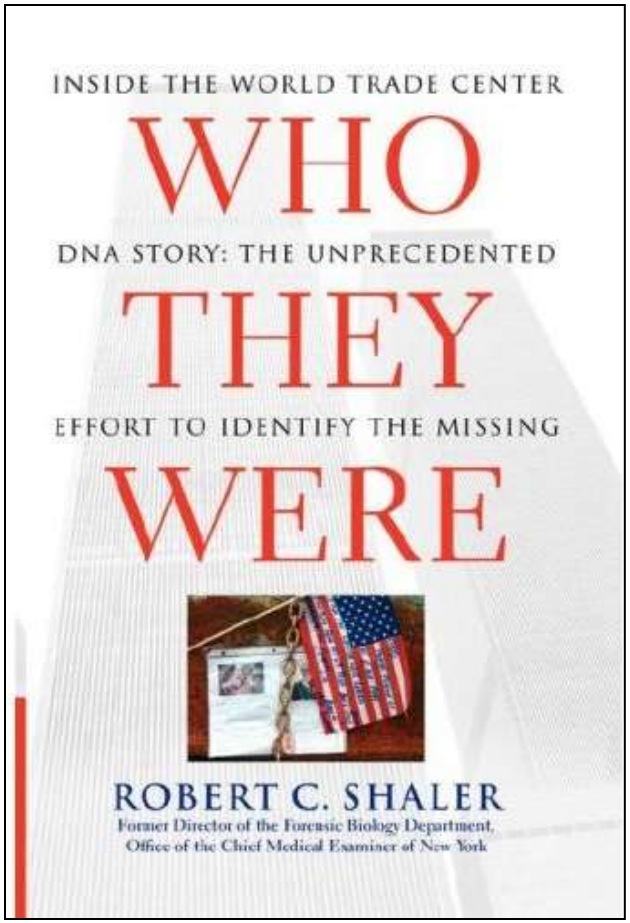
Unknown Sample

- DNA results from human remains (unknown sample) are compared against DNA results from samples of known origin (reference samples)
- If a match occurs, statistical analysis is performed and a report is issued to the appropriate individual

Slide courtesy of Dr. Amanda Sozer, SNA International

http://www.bio-itworld.com/archive/091103/soul.html

Number of Remains Identified as of 2004



Free Press (2005)

Statistics (July 26, 2004)

Total Reported Missing:	**2,749**
Number of Remains:	**19,915**
Number Identified:	**1,560** (5 pending)
Whole Bodies Recovered:	239

WTC MFISys Statistics (4.30.2004)

52,528 STR profiles (including miniSTR data)

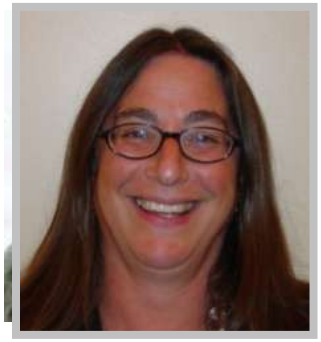
31,155 mtDNA sequences

10,799 SNP profiles

Kinship and Data Analysis Panel (KADAP)

- **Developed & funded by the National Institute of Justice**
- Group of **~25 subject matter experts** gathered to advise NYC OCME on WTC DNA identification matters
- Met almost every other month for the two years following Sept 11, 2001 usually in DC or NY to review data, make recommendations, and discuss methodologies and innovations
- Prepared a *Lessons Learned document* to aid with future mass disaster DNA identification efforts and published a Nov 2005 article in *Science* on the WTC DNA Identifications

KADAP Leaders



Lisa Forman
National Institute of Justice

Amanda Sozer
NIJ Contractor

Steve Niezgoda
NIJ Contractor

NIJ WTC KADAP
(Kinship and Data Analysis Panel)

- Robert Shaler, Ph.D., Sc.D. NYC OCME
- Howard Baum, Ph.D. NYC OCME
- Fred Bieber, M.D, Ph.D. Harvard Med
- Bruce Budowle, Ph.D. FBI
- George Carmody, Ph.D. Carleton U.
- Ken Kidd, Ph.D. Yale
- Mike Conneally, Ph.D. Indiana U.
- Art Eisenberg, Ph.D. U. North Texas
- Mark Dale NY State Police
- Barry Duceman, Ph.D. NY State Police
- Dennis Gaige NY State Police
- Steve Swinton NY State Police
- Anne Walsh, Ph.D. NY State Dept Public Health
- Jack Ballantyne, Ph.D. U. Central Florida
- Joan Bailey-Wilson, Ph.D. NIH
- Leslie Biesecker, Ph.D. NIH
- Lisa Forman, Ph.D. NIJ
- Benoit Leclair, Ph.D. Myriad Genetics
- Steve Niezgoda, MBA NIJ Contractor
- Tom Parsons, Ph.D. AFDIL
- Elizabeth Pugh, Ph.D. NIH/CIDR
- Steve Sherry, Ph.D. NIH/NCBI
- Mandy Sozer, Ph.D. NIJ Contractor
- Lois Tully, Ph.D. NIJ
- Charles Brenner, Ph.D. DNA View
- Mike Hennessy GeneCode Forensics
- Judy Nolan, Ph.D. GeneCode Forensics
- John Butler, Ph.D. NIST

Met in NYC, Albany, DC, Baltimore
Oct 2001, Dec 2001, Feb 2002, Apr 2002, July 2002, Sept 2002, Jan 2003, July 2003, June 2005

A “Lessons Learned” document was published by NIJ in September 2006…

Efforts for WTC Victim Identification Using DNA Testing

Government/Corporate/University Participation

- **OCME Staff**
- **NYSP**
- **NYPD**
- **NIJ**
- **FBI**
- **NCBI**
- **NIH**
- **NIST**
- **NYSDOH**
- **AFDIL**

- **Myriad Genetics**
- **Bode Technology Group**
- **Gene Codes Forensics**
- **Celera Genomics**
- **Orchid Biosciences**
- **Johns Hopkins University**
- **SAIC**
- **Harvard University**
- **NYU Med. School**
- **Columbia Med. School**
- **Porter-Lee**

WTC Lessons Learned

- Available at **http://massfatality.dna.gov**

- 142 pages
- 14 chapters
- 9 appendices

http://massfatality.dna.gov

Some Chapters from the WTC Lessons Learned

CHAPTER 5

Managing Expectations

CHAPTER 14

Quality Control

CHAPTER 7

Media Relations

Because DNA technology is of such interest to the public, there are likely to be many DNA-related questions from the media. To minimize the potential for misunderstandings, there should be a single point of contact between the laboratory and the press, and laboratory staff should be instructed on how to respond if contacted directly by the media. Through press briefings, the laboratory director can help educate the public and manage expectations by providing a realistic picture of what DNA analysis can—and cannot—do.

WTC KADAP Lessons Learned: http://massfatality.dna.gov

Outsourcing DNA Testing…

APPENDIX F

Issues to Consider When Outsourcing Reference Samples

There are many issues a laboratory director must consider when making the decision to send mass fatality samples to an outside vendor for short tandem repeat (STR) analysis testing. This list of issues is not meant to be inclusive; rather, it is offered as a starting point to aid in considering the use of a vendor laboratory to test personal items, reference samples, or remains samples.

- Requirements that changes in the vendor's key personnel (specific personnel) be approved.
- Protocols and procedures for making analysis of the samples, quality control documents, and validation documentation available for review, inspection, and monitoring, including onsite reviews of the vendor's facility and records.

WTC KADAP Lessons Learned: http://massfatality.dna.gov (p. 101)

Material Flow Between Laboratories Involved in Processing World Trade Center DNA Samples

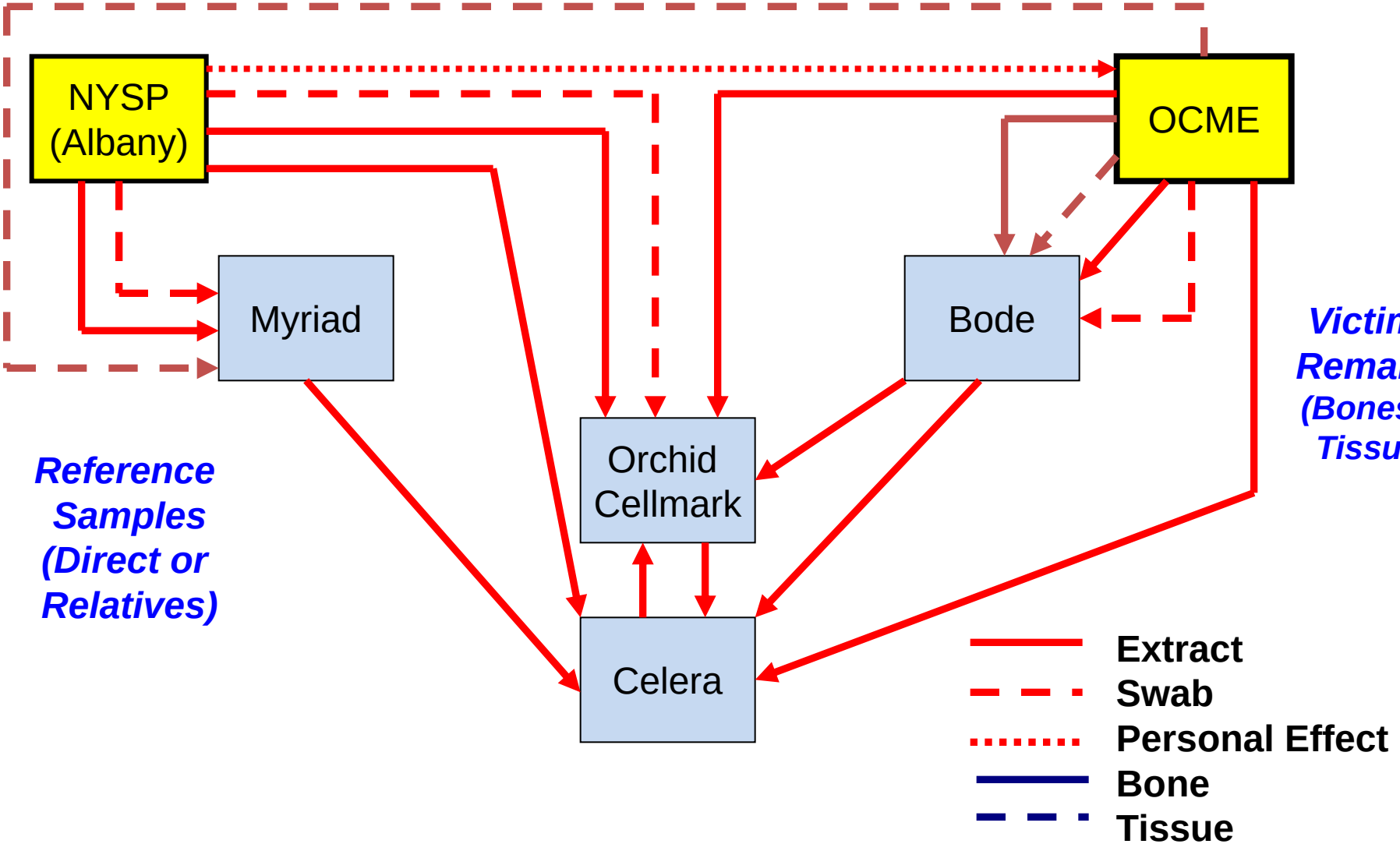


Figure 24.4, J.M. Butler (2005) *Forensic DNA Typing*, 2nd Edition © 2005 Elsevier Academic Press

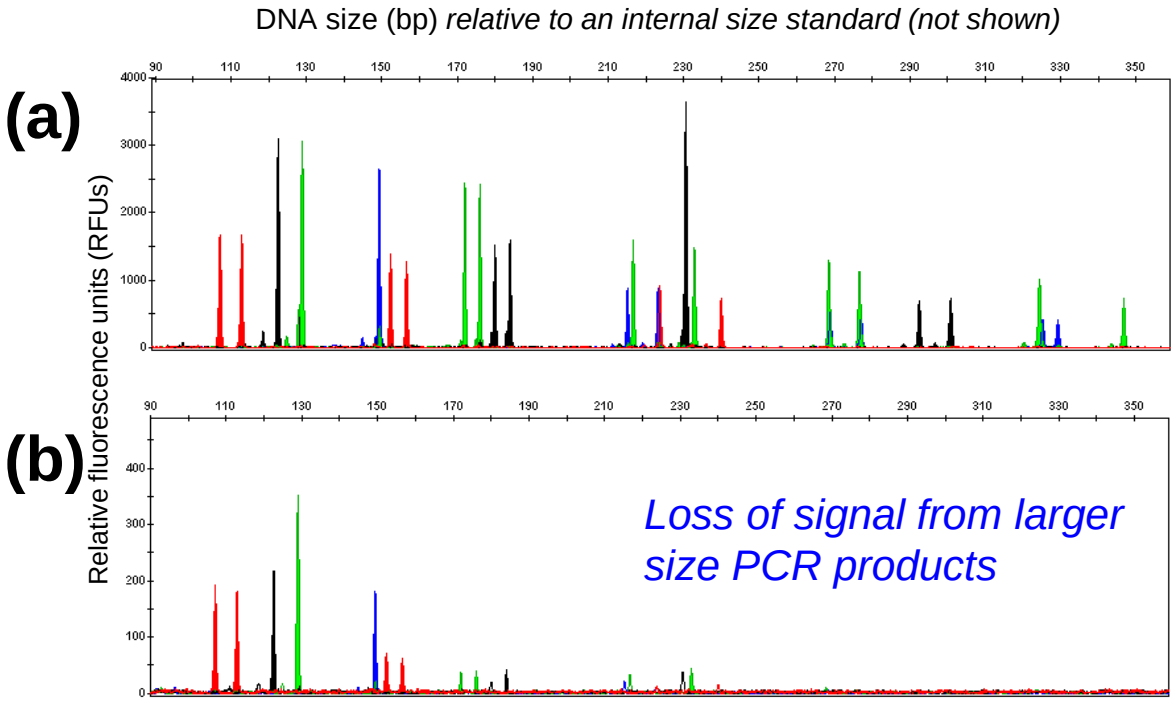
DNA Innovations Used in WTC

- Improved assays to handle degraded DNA
  - **miniSTRs** (NIST/OhioU → Bode)
  - **SNPs** (Orchid Cellmark) – used on an experimental basis
  - **High-throughput mtDNA CR sequencing** (Celera)

- Improved DNA extraction from bone
  - Bode Technology Group (refined AFDIL methods?)

- New or modified software for data analysis
  - **M-FISys** (Gene Codes Forensics) – created from scratch for WTC
  - **MDKAP** (Benoit Leclair – Myriad Genetics)
  - **DNA-View** new module (Charles Brenner – consultant)

Comparison of Full vs. Partial DNA Profiles



Full Profile (Reference sample)

Partial Profile (Casework sample)

Reduced-sized PCR products (aka miniSTRs) provide an opportunity to recover this information

Bode Technology Group – WTC Phase I summary

12,392	**Bone samples processed**
3,405	**Full profiles (13 STR loci)**
2,143	**High partial profiles (≥7 STR loci)**
2,670	**Low partial profiles (<7 STR loci)**
4,174	**No loci**

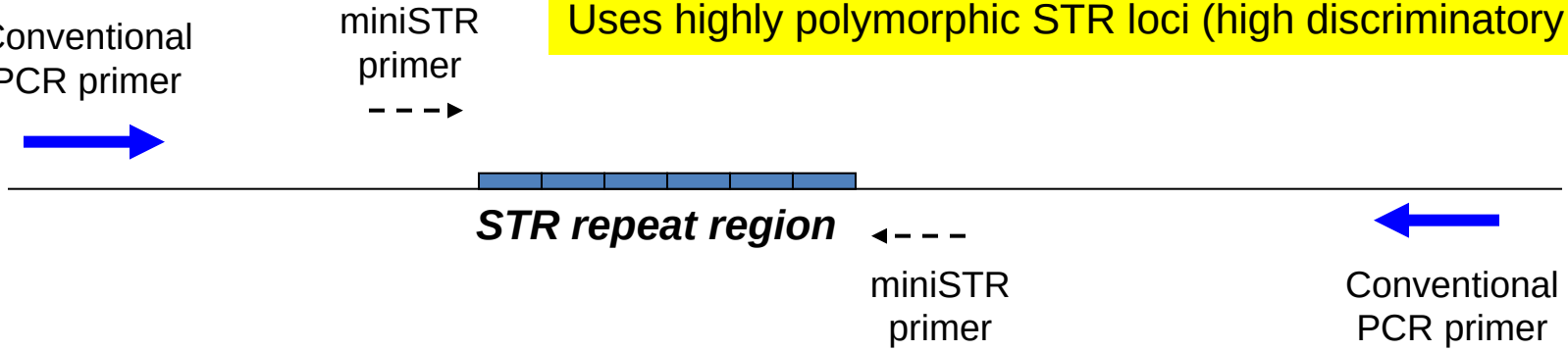
>50% of samples tested

Figure 10.3, J.M. Butler (2011) *Advanced Topics in Forensic DNA Typing: Methodology*

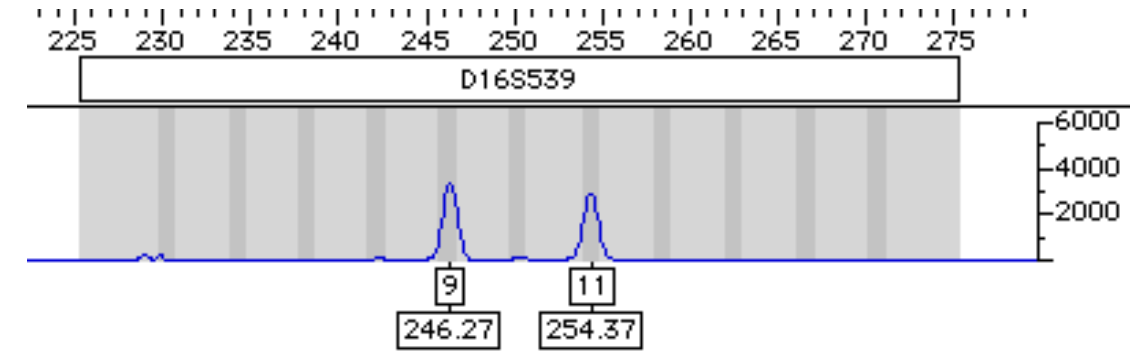
miniSTRs

Advantages of Approach:
Size reduction enhances success rate with degraded DNA
Retains same marker information (database compatibility)
Uses highly polymorphic STR loci (high discriminatory power)

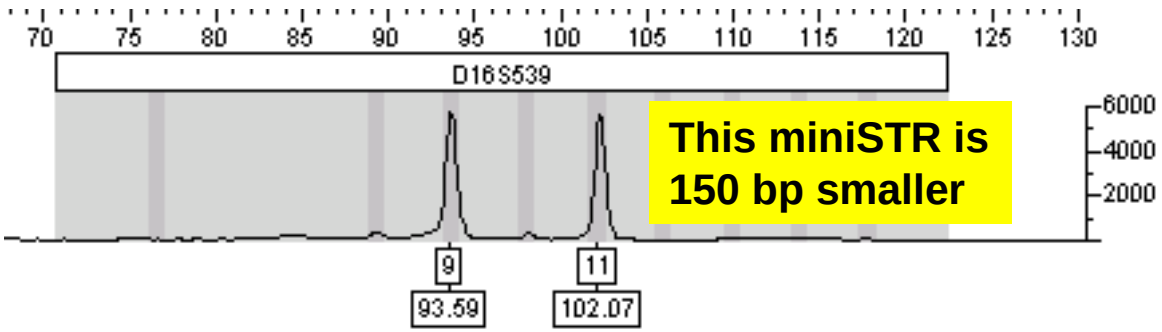
(a)



(b)

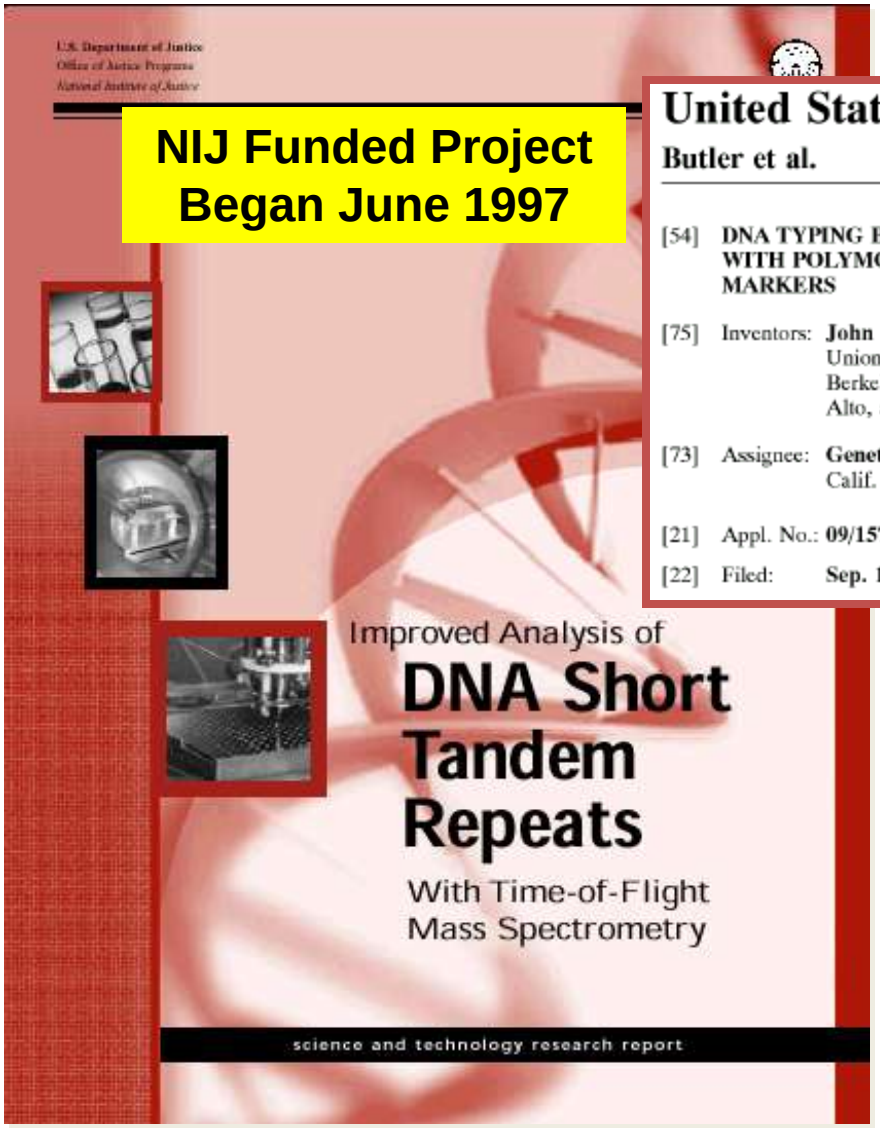


Conventional STR test (COfiler kit)



MiniSTR assay (using Butler *et al.* 2003 primers)

Most of the miniSTR Primers Came from Previous NIJ-Funded Work with Mass Spectrometry



United States Patent [19]
Butler et al.

[11] **Patent Number: 6,090,558**
[45] **Date of Patent: Jul. 18, 2000**

[54] **DNA TYPING BY MASS SPECTROMETRY WITH POLYMORPHIC DNA REPEAT MARKERS**

[75] Inventors: **John M. Butler**, Menlo Park; **Jia Li**, Union City; **Joseph A. Monforte**, Berkeley; **Christopher H. Becker**, Palo Alto, all of Calif.

[73] Assignee: **Genetrace Systems, Inc.**, Alameda, Calif.

[21] Appl. No.: **09/157,177**

[22] Filed: **Sep. 18, 1998**

Becker et al., "Genetic analysis of short tandem repeat loci by time of flight mass spectrometry," Seventh International Symposium on Human Identification (1996), pp. 158–162, 1997.
Braun et al., "Detecting CFTR gene mutations by using primer oligo base extension and mass spectrometry," *Clin. Chem.* 43:1151–1158, 1997.
Braun et al., "Improved Analysis of Microsatellites Using Mass Spectrometry," *Genomics* 46:18–23, 1997.
Butler et al., "High–throughput STR Analysis by Time–of–Flight Mass Spectrometry," Proceedings of the Second European Symposium on Human Identification 1998, Promega Corporation, in press (1998).
Butler et al., "Rapid and Automated Analysis of Short Tandem Repeat Loci Using Time–of–Flight Mass Spectrom-

Most of the new miniplex primer sequences had already been described in the NIJ report and US Patent 6,090,558 (originally designed for use with STR typing by mass spectrometry)

http://www.ojp.usdoj.gov/nij/pubs-sum/188292.htm

Brief Timeline on Development of miniSTR Assays

- Project begun in November 2001 at the request of Bob Shaler to aid WTC DNA identifications
- Primers were designed to come as close as possible to the repeat region to generate the smallest possible PCR products for optimal recovery of information from degraded DNA
- Collaboration with Bruce McCord (then at Ohio University)
- Focus was on testing to demonstrate that equivalent genotypes could be produced compared with commercial STR kits
- Information supplied to Bode Technology Group in April 2002 and developed into two “BodePlexes” during summer 2002
- “BodePlexes” were used to increase success rates with bone samples during remaining WTC testing

NIST/OhioU miniplex Primer Sets

Dye combinations were chosen because matrix is commercially available and works well on ABI 310/3100

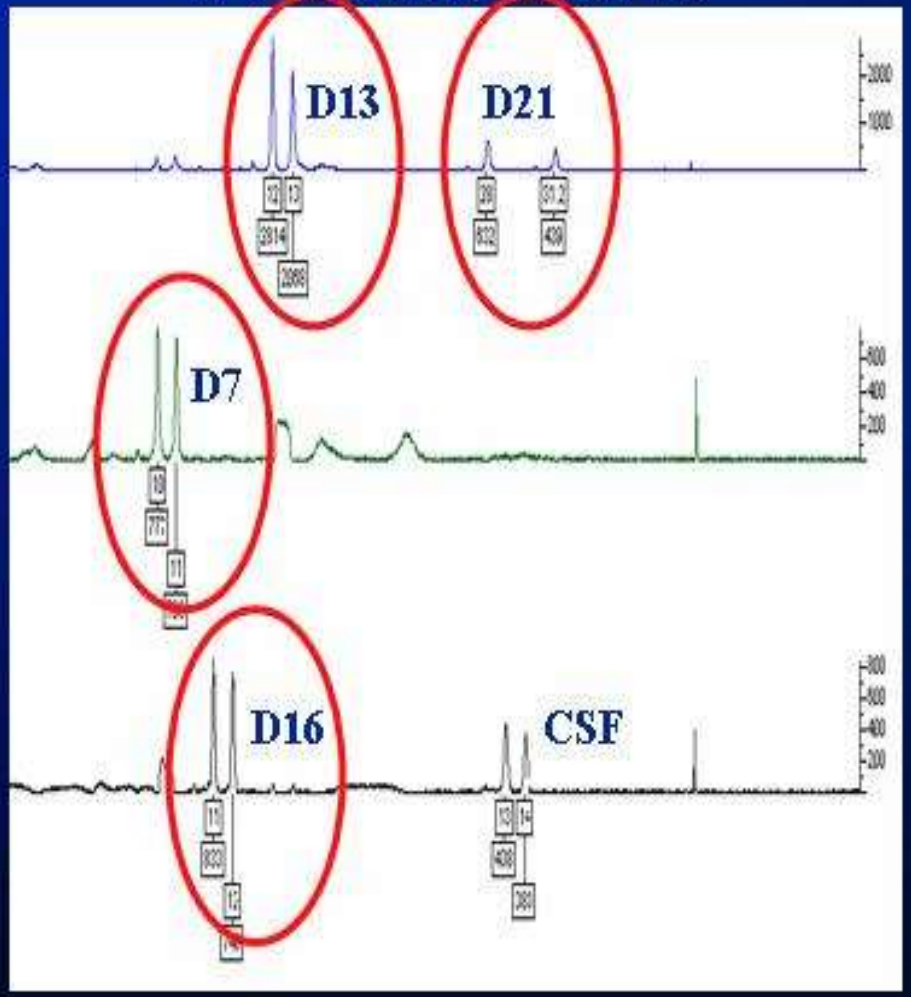
	6FAM	VIC	NED	PET
Miniplex 1	TH01	CSF1PO	TPOX	D3S1358
Miniplex 2	D5S818	D8S1179	D16S539	Penta D
Miniplex 3	FGA	D21S11	D7S820	Penta E
Miniplex 4	VWA	D18S51	D13S317	D2S1338
Miniplex 5	Penta D	Penta E	D2S1338	
"Big Mini"	TH01, FGA	CSF, D21	TPOX, D7	

Only Big Mini supplied to OCME
per recommendation of KADAP

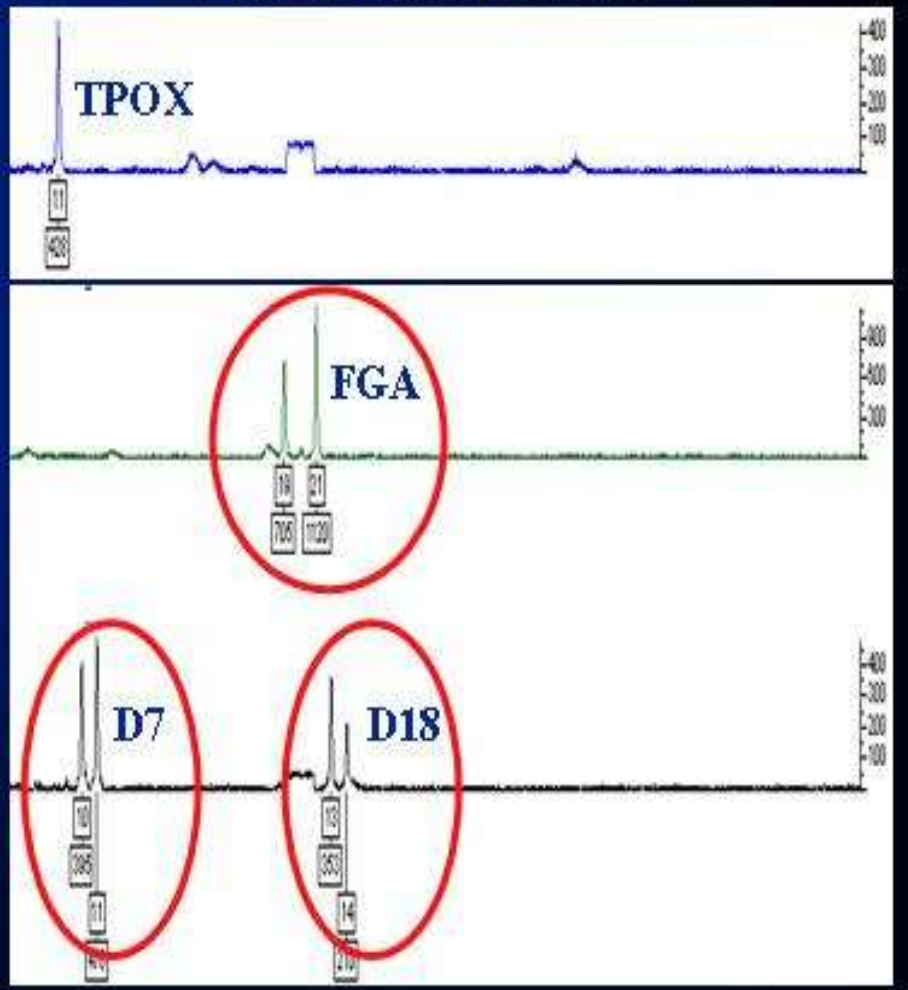
Testing can be performed in 4-dye or 5-dye combinations using either ROX or LIZ labeled internal size standards

Comparison: Profiler Plus/COfiler vs. BodePlexes

BodePlex 1



BodePlex 2



The Bode Technology Group, Inc.

Improved DNA Extraction from Bone Samples

CROATIAN MEDICAL JOURNAL

CMJ

44(3):264-272,2003

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Available online at www.sciencedirect.com

ScienceDirect

ELSEVIER

Forensic Science International: Genetics 1 (2007) 191–195

FSI GENETICS

www.elsevier.com/locate/fsig

Short communication

High efficiency DNA extraction from bone by total demineralization☆

Odile M. Loreille*, Toni M. Diegoli, Jodi A. Irwin, Michael D. Coble, Thomas J. Parsons[1]

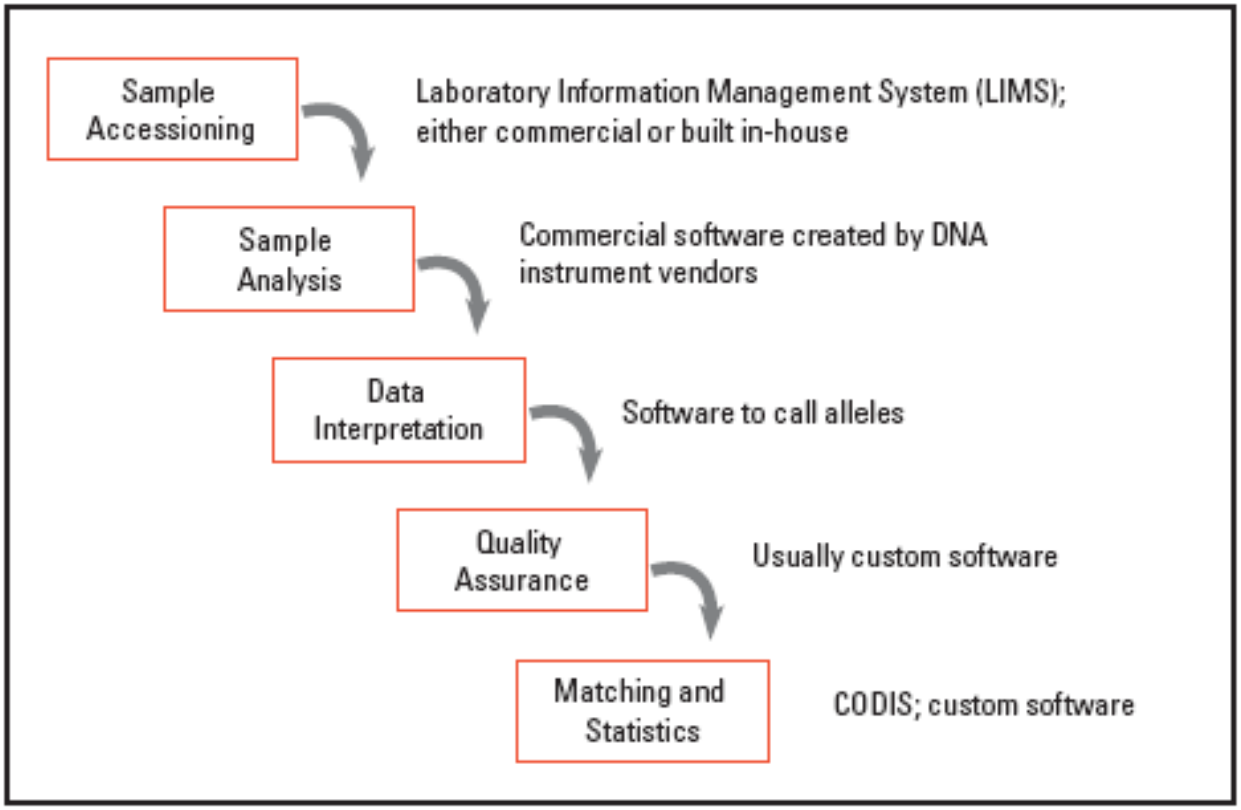
Armed Forces DNA Identification Laboratory, 1413 Research Blvd., Bldg. 101, Rockville, MD 20850, United States

Received 24 January 2007; accepted 3 February 2007

Probably had the biggest impact in improving success rates of DNA information recovery in the end but took a while to develop…

Information Technology Needed

Exhibit 14: Information Technology in a DNA Laboratory



WTC KADAP Lessons Learned: http://massfatality.dna.gov (p. 54)

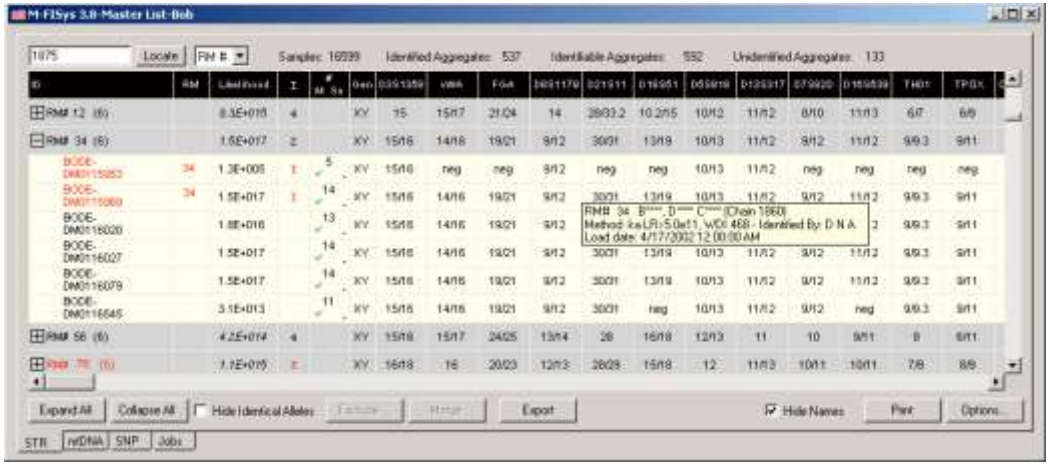
M-FISys Software

Mass Fatality Identification System

http://www.bio-itworld.com/archive/091103/soul.html

Howard Cash and
Gene Codes Forensics

M-FISys worked through **a direct match algorithm** and helped in **collapsing and sorting data sets** to obtain identifications



http://www.genecodesforensics.com/news/CashHoyleSutton.pdf

Pac Symp Biocomput. 2003;:638-53.
PMID: 12603064

DEVELOPMENT UNDER EXTREME CONDITIONS: FORENSIC BIOINFORMATICS IN THE WAKE OF THE WORLD TRADE CENTER DISASTER

HOWARD D. CASH, JONATHAN W. HOYLE, AMY J. SUTTON
Gene Codes Forensics, 775 Technology Drive, Suite 100A, Ann Arbor, MI 48108, USA

MDKAP

Mass Disaster Kinship Analysis Program

Software had been developed initially for Swiss Air Flight 111 (RCMP; 1998)

Benoit LeClair
Myriad Genetics

MDKAP performed **kinship analyses** through **pairwise comparisons**

J .Forensic Sci. (2007) 52: 806-819

J Forensic Sci, July 2007, Vol. 52, No. 4
doi: 10.1111/j.1556-4029.2007.00456.x
Available online at: www.blackwell-synergy.com

Benoît Leclair,[1] Ph.D.; Robert Shaler,[2†] Ph.D.; George R. Carmody,[3] Ph.D.; Kristilyn Eliason,[1] B.Sc.; Brant C. Hendrickson,[1‡] M.Sc.; Thad Judkins,[1] B.Sc.; Michael J. Norton,[1§] B.Sc.; Christopher Sears,[4] Ph.D.; and Tom Scholl,[1,5‡] Ph.D.

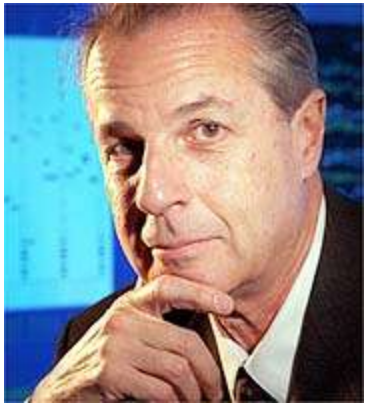
Bioinformatics and Human Identification in Mass Fatality Incidents: The World Trade Center Disaster*

Now available as **Bloodhound** from Ananomouse

http://www.ananomouse.com/products/bloodhound.asp

DNA-View
(new module for disaster matching)

http://dna-view.com/



Charles Brenner
Consultant

DNA View deduced **kinship by pedigree analyses**; re-written to handle large WTC data sets

ACADEMIC PRESS

Available online at www.sciencedirect.com
SCIENCE DIRECT®

Theoretical Population Biology 63 (2003) 173–178

Theoretical Population Biology
http://www.elsevier.com/locate/ytpbi

Issues and strategies in the DNA identification of World Trade Center victims

C.H. Brenner[a,*] and B.S. Weir[b]

[a] *6568 Sobrante Road, Oakland, CA 94611-1123, USA*
[b] *Program in Statistical Genetics, Department of Statistics, North Carolina State University, Raleigh, NC 27695-7566, USA*

Received 11 November 2002

Benefits of DNA Innovations **Born from WTC**

- **Improved software for missing persons**
  - **OSIRIS** (NIH-developed open-source software)

    Free download available at NCBI website:
    http://www.ncbi.nlm.nih.gov/projects/SNP/osiris/
  - CODIS 6.0 (and beyond) include kinship capabilities

- **Improved DNA assays and extraction**
  - Commercially available miniSTR kits (MiniFiler)
  - New miniSTR loci have led to new European and U.S. core loci (D10S1248 and D2S441)

- **Improved disaster victim identification (DVI) recommendations and preparations**

A number of miniSTR articles have been published based on initial WTC efforts…

J Forensic Sci, September 2003, Vol. 48, No. 5
Paper ID JFS2003043_485
Available online at: www.astm.org

John M. Butler,[1] Ph.D.; Yin Shen,[2,3] Ph.D.; and Bruce R. McCord, Ph.D.[2]

The Development of Reduced Size STR Amplicons as Tools for Analysis of Degraded DNA*

Bruce McCord
NIJ Grant 2002-IJ-CX-K007

FOR THE RECORD

Jiří Drábek,[1] Ph.D.; Denise T. Chung,[1] B.S.; John M. Butler,[2] Ph.D.; and Bruce R. McCord,[1] Ph.D.

Concordance Study Between Miniplex Assays and a Commercial STR Typing Kit*

J Forensic Sci, July 2004, Vol. 49, No. 4
Paper ID JFS2003269
Available online at: www.astm.org

Denise T. Chung,[1] B.S.; Jiří Drábek,[1] Ph.D.; Kerry L. Opel,[1] M.A.; John M. Butler,[2] Ph.D.; and Bruce R. McCord,[1] Ph.D.

A Study on the Effects of Degradation and Template Concentration on the Amplification Efficiency of the STR Miniplex Primer Sets*

Technical Note

Kerry L. Opel,[1] M.A.; Denise T. Chung,[2,3] Ph.D.; Jiří Drábek,[2,6] Ph.D.; Nancy E. Tatarek,[3] Ph.D.; Lee Meadows Jantz,[4] Ph.D.; and Bruce R. McCord,[1] Ph.D.

The Application of Miniplex Primer Sets in the Analysis of Degraded DNA from Human Skeletal Remains*

J Forensic Sci, November 2007, Vol. 52, No. 6
doi: 10.1111/j.1556-4029.2007.00584.x
Available online at: www.blackwell-synergy.com

Kerry L. Opel,[1,2] M.A.; Denise T. Chung,[2,3] Ph.D.; Jiří Drábek,[2,4] Ph.D.; John M. Butler,[5] Ph.D.; and Bruce R. McCord,[1] Ph.D.

Developmental Validation of Reduced-Size STR Miniplex Primer Sets*

Maurice J. Aboud[1,2]
Marcus Gassmann[1,2]
Bruce R. McCord[1,2]

[1]Chemistry Department, Florida International University, Miami, FL, USA
[2]R&D Assay Development, Agilent Technologies R&D Life Science Solutions Unit Liquid Phase Analysis Division, Waldbronn, Germany

Received January 20, 2010
Revised April 11, 2010
Accepted April 14, 2010

Research Article

The development of mini pentameric STR loci for rapid analysis of forensic DNA samples on a microfluidic system

There is increasing interest in developing methods for portable DNA analysis in mass disasters and criminal identification. Currently most forensic STR DNA analysis is performed by CE; however, these instruments are not portable and require long sample run times. One potential solution is the development of microfluidic systems for DNA typing. Unfortunately, fairly long (ca. 20 cm) separation channels are usually required for the proper resolution of multiplexed STR loci used in human identification. Commercially available systems like the Agilent 2100 Bioanalyzer have a small footprint and utilize chips

MiniFiler (a commercial miniSTR kit)

life technologies | applied biosystems

Store Log In

PRODUCTS APPLICATIONS & TECHNOLOGIES SERVICES SUPP

MiniFiler™ Kit

Lost Loci. Recovered.™

J Forensic Sci, July 2008, Vol. 53, No. 4
doi: 10.1111/j.1556-4029.2008.00760.x
Available online at: www.blackwell-synergy.com

TECHNICAL NOTE

Julio J. Mulero,[1] Ph.D.; Chien Wei Chang,[1] Ph.D.; Robert E. Lagacé,[1] B.A.; Dennis Y. Wang,[1] Ph.D.; Jennifer L. Bas,[2†] M.F.S.; Timothy P. McMahon,[2‡] Ph.D.; and Lori K. Hennessy,[1] Ph.D.

Development and Validation of the AmpFℓSTR® MiniFiler™ PCR Amplification Kit: A MiniSTR Multiplex for the Analysis of Degraded and/or PCR Inhibited DNA*

Put a face to your cold case

Now Available: Proven miniSTR technology in an easy-to-use kit.

J Forensic Sci, July 2007, Vol. 52, No. 4
doi: 10.1111/j.1556-4029.2007.00491.x
Available online at: www.blackwell-synergy.com

TECHNICAL NOTE

Carolyn R. Hill,[1] M.S.; Margaret C. Kline,[1] M.S.; Julio J. Mulero,[2] Ph.D.; Robert E. Lagacé,[2] B.A.; Chien-Wei Chang,[2] Ph.D.; Lori K. Hennessy,[2] Ph.D.; and John M. Butler,[1] Ph.D.

Concordance Study Between the AmpFℓSTR® MiniFiler™ PCR Amplification Kit and Conventional STR Typing Kits*

At NIST, we expanded to non-CODIS (NC) loci…

J Forensic Sci, Jan. 2005, Vol. 50, No. 1
Paper ID JFS2004216
Available online at: www.astm.org

Michael D. Coble,[1] Ph.D. and John M. Butler,[1] Ph.D.

Characterization of New MiniSTR Loci to Aid Analysis of Degraded DNA*

International Congress Series 1288 (2006) 504–506
ELSEVIER
www.ics-elsevier.com

Characterization and performance of new MiniSTR loci for typing degraded samples

M.D. Coble *, C.R. Hill, P.M. Vallone, J.M. Butler

National Institute of Standards and Technology, Biochemical Sciences Division, 100 Bureau Drive, Mail Stop 8311, Gaithersburg, MD, 20899-8311, USA

J Forensic Sci, January 2008, Vol. 53, No. 1
doi: 10.1111/j.1556-4029.2008.00595.x
Available online at: www.blackwell-synergy.com

Carolyn R. Hill, M.S.; Margaret C. Kline, M.S.; Michael D. Coble,† Ph.D.; and John M. Butler, Ph.D.

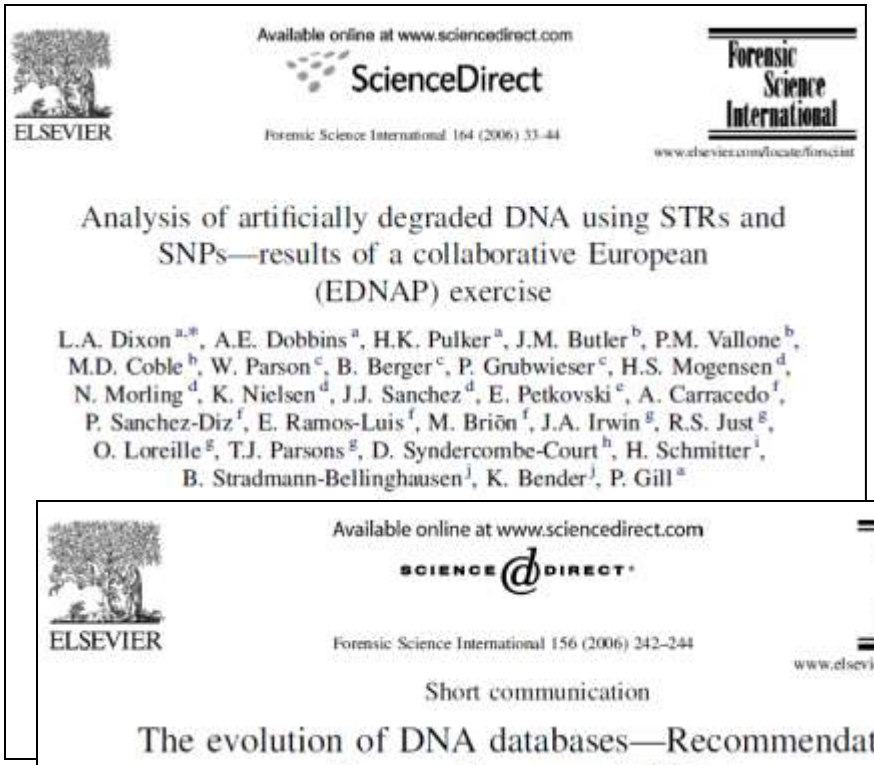
Characterization of 26 MiniSTR Loci for Improved Analysis of Degraded DNA Samples

J Forensic Sci, September 2009, Vol. 54, No. 5
doi: 10.1111/j.1556-4029.2009.01110.x
Available online at: www.blackwell-synergy.com

Carolyn R. Hill,[1] M.S.; John M. Butler,[1] Ph.D.; and Peter M. Vallone,[1] Ph.D.

A 26plex Autosomal STR Assay to Aid Human Identity Testing*†

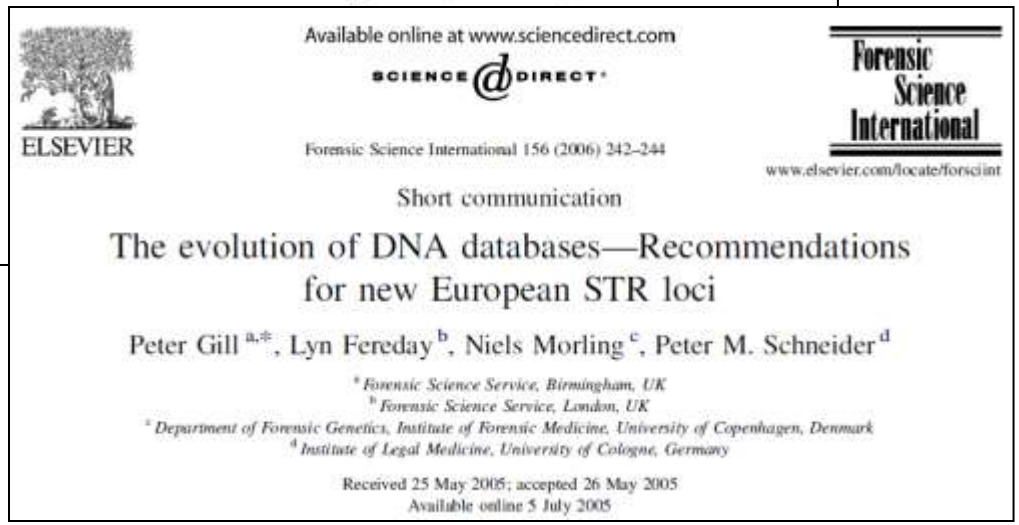
European Use and Promotion of miniSTRs



Available online at www.sciencedirect.com
ScienceDirect
Forensic Science International 164 (2006) 33–44
Forensic Science International
www.elsevier.com/locate/forsciint

Analysis of artificially degraded DNA using STRs and SNPs—results of a collaborative European (EDNAP) exercise

L.A. Dixon [a,*], A.E. Dobbins [a], H.K. Pulker [a], J.M. Butler [b], P.M. Vallone [b], M.D. Coble [b], W. Parson [c], B. Berger [c], P. Grubwieser [c], H.S. Mogensen [d], N. Morling [d], K. Nielsen [d], J.J. Sanchez [d], E. Petkovski [e], A. Carracedo [f], P. Sanchez-Diz [f], E. Ramos-Luis [f], M. Briõn [f], J.A. Irwin [g], R.S. Just [g], O. Loreille [g], T.J. Parsons [g], D. Syndercombe-Court [h], H. Schmitter [i], B. Stradmann-Bellinghausen [j], K. Bender [j], P. Gill [a]



Available online at www.sciencedirect.com
SCIENCE DIRECT
Forensic Science International 156 (2006) 242–244
Forensic Science International
www.elsevier.com/locate/forsciint

Short communication

The evolution of DNA databases—Recommendations for new European STR loci

Peter Gill [a,*], Lyn Fereday [b], Niels Morling [c], Peter M. Schneider [d]

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[b] Forensic Science Service, London, UK
[c] Department of Forensic Genetics, Institute of Forensic Medicine, University of Copenhagen, Denmark
[d] Institute of Legal Medicine, University of Cologne, Germany

Received 25 May 2005; accepted 26 May 2005
Available online 5 July 2005

A highly successful performance of miniSTRs compared to SNPs and conventional STR systems led to European promotion of miniSTRs

At concurrent meetings held on 4–5 April, 2005, in Glasgow, UK by the EDNAP and ENFSI groups, as a result of collaborative exercises and a review of the literature, the following recommendations were made:
(1) **Mini-STRs to be adopted as the way forward to increase both the robustness and sensitivity of analysis**.

The April 2011 announcement of new core U.S. loci includes several miniSTR systems

Table of ranked list of CODIS core loci and ranking criteria.

Locus	No known association with medical
Section A (required)	
Amelogenin	NA[b]
D18S51	●
FGA	●
D21S11	●
D8S1179	●
vWA	●
D13S317	●
D16S539	●
D7S820	●
TH01	●
D3S1358	●
D5S818	●
CSF1PO	●
D2S1338	●
D19S433	●
D1S1656	●
D12S391	●
D2S441	●
D10S1248	●
Penta E	●
DYS391	●
Section B (in order of preference)	
TPOX	●
D22S1045	●
SE33	●
Penta D	●

D2S441
D10S1248

G Model
FSIGEN-739; No. of Pages 3
ARTICLE IN PRESS
Forensic Science International: Genetics xxx (2011) xxx–xxx
Contents lists available at ScienceDirect
Forensic Science International: Genetics
journal homepage: www.elsevier.com/locate/fsig

Letter to the Editor

Expanding the CODIS core loci in the United States

Dear Editor:

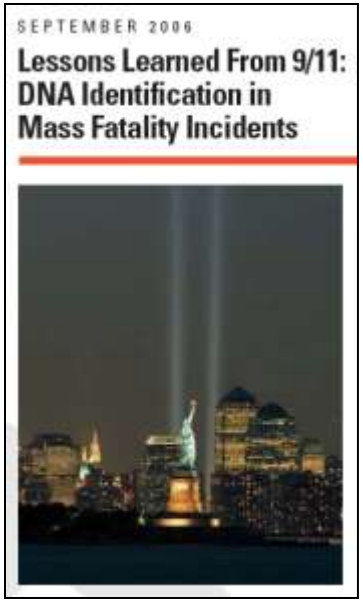
After over a decade of operation, the National DNA Index System (NDIS) continues to grow in importance and size [1]. While the STR DNA technology has remained relatively consistent, other key aspects of the NDIS program have been reevaluated and revisions implemented. For example, based upon recommendations of the Scientific Working Group on DNA Analysis Methods, the Director of the Federal Bureau of Investigation (FBI) issued

major reasons for expanding the CODIS core loci in the United States:

(1) To reduce the likelihood of adventitious matches [7] as the number of profiles stored at NDIS continues to increase each year (expected to total over 10 million profiles by the time of this publication). There are no signs that this trend will slow down as States expand the coverage of their DNA database programs and increase laboratory efficiency and capacity.
(2) To increase international compatibility to assist law enforcement data sharing efforts.
(3) To increase discrimination power to aid missing persons cases.

Hares, D.R. (2011). Expanding the CODIS core loci in the United States. *FSI Genetics (in press)*

We are better prepared for the future…



ELSEVIER

Forensic Science International: Genetics 1 (2007) 3–12

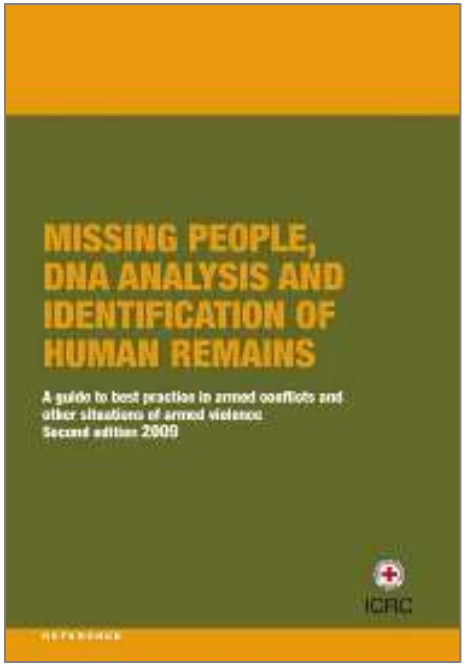
GENETICS

www.elsevier.com/locate/fsig

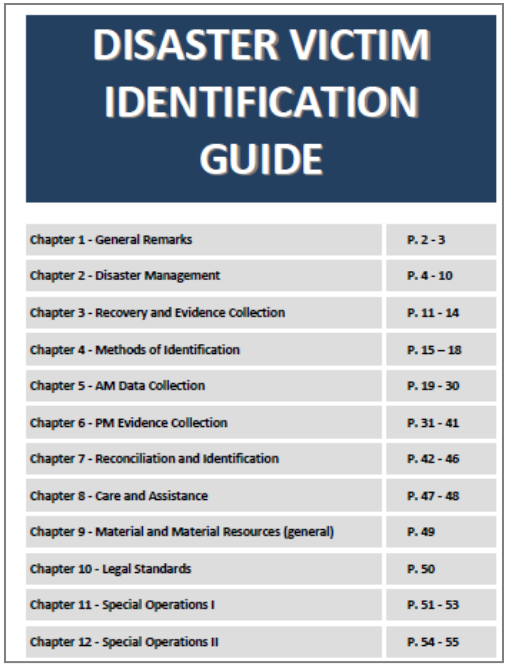
Review

DNA Commission of the International Society for Forensic Genetics (ISFG): Recommendations regarding the role of forensic genetics for disaster victim identification (DVI)

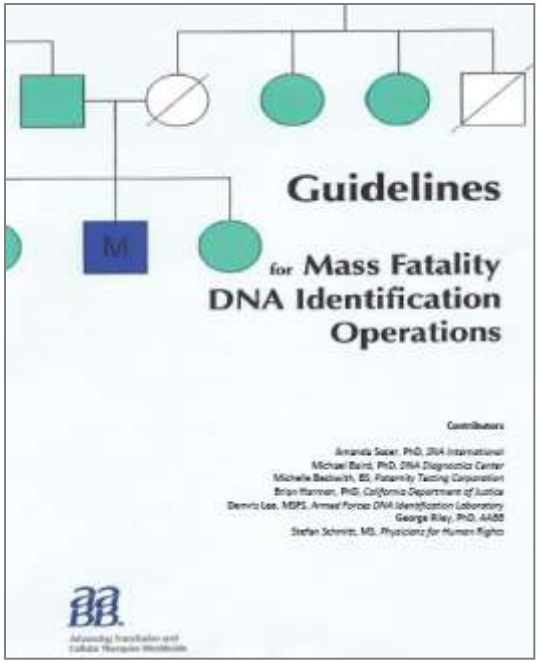
M. Prinz [a,*], A. Carracedo [b], W.R. Mayr [c], N. Morling [d], T.J. Parsons [e], A. Sajantila [f], R. Scheithauer [g], H. Schmitter [h], P.M. Schneider [i]



International Red Cross (2009)



Interpol (2009)



AABB (2010)

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- Pete Vallone & Gordon Spangler (NIST) – Orchid SNP validation work

- Mike Coble & Becky Hill (NIST) – 26 new NC miniSTR loci

- Bob Shaler & Lisa Forman – for getting me involved in WTC efforts

- Lisa Forman Neall, Amanda Sozer, & Mecki Prinz – input on slides

- Fellow WTC KADAP members

Thank you for your attention!

Picture taken at Ground Zero on September 10, 2002