

FORENSIC TECHNOLOGIES: NEW AND GROWING MARKETS



SAS003E
October 2013

Kevin Gainer
Project Analyst

ISBN: 1-56965-584-7

bcc | Research
Market Forecasting

BCC Research
49 Walnut Park, Building 2
Wellesley, MA 02481
866-285-7215, 781-489-7301
www.bccresearch.com
Custom Reports:
carol.laverty@bccresearch.com

TABLE OF CONTENTS

TOPIC	PAGE NO.
CHAPTER 1 INTRODUCTION	2
STUDY GOALS AND OBJECTIVES	2
REASONS FOR DOING THIS STUDY AND ITS IMPORTANCE	2
INTENDED AUDIENCE	3
SCOPE AND FORMAT OF REPORT	3
METHODOLOGY AND INFORMATION SOURCES	3
ANALYST CREDENTIALS	3
RELATED BCC REPORTS	4
BCC ONLINE SERVICES	4
DISCLAIMER	4
CHAPTER 2 SUMMARY	6
MAJOR FINDINGS	6
<i>SUMMARY TABLE MAJOR U.S. FORENSIC PRODUCTS AND SERVICES MARKET SEGMENTS FORECAST, THROUGH 2018 (\$ MILLIONS)</i>	8
<i>SUMMARY FIGURE MAJOR U.S. FORENSIC PRODUCTS AND SERVICES MARKET SEGMENTS FORECAST, 2012-2018 (\$ MILLIONS)</i>	9
CHAPTER 3 ANALYSIS OF MAJOR FORENSIC MARKETS	11
DEFINITION OF FORENSIC SCIENCE	11
FORENSICS AS AN ECONOMIC SECTOR	11
HISTORY OF FORENSIC SCIENCE	11
U.S. FORENSIC LABORATORIES	12
TRENDS IN COMPUTERIZATION OF CRIME LABORATORIES	13
MEDICAL EXAMINERS AND CORONERS	14
<i>TABLE 1 PERCENTAGE OF U.S. LABORATORIES PERFORMING VARIOUS FORENSIC FUNCTIONS (%)</i>	15
CRIME RATES AND FORENSIC BACKLOGS	15
GOVERNMENTAL OVERSIGHT OF FORENSICS	16
CRIMINAL JUSTICE AND FORENSIC SCIENCE REFORM ACT OF 2011	16
GOVERNMENTAL OVERSIGHT	17
<i>TABLE 2 STATES WITH FORENSIC OVERSIGHT BOARDS, 2013</i>	17
THE GROWING ROLE OF FORENSIC DATABASES	18
FINGERPRINT DATABASES	18
NEXT GENERATION IDENTIFICATION (NGI)	19
National Palm Print System (NPPS)	19
Quality Check Automation (QCA)	20
Enhanced IAFIS Repository (EIR)	20
DEPARTMENT OF DEFENSE FINGERPRINT/BIOMETRICS	20
FORENSIC DATABASES	20
Ident-A-Drug	20
Paint Data Query: PDQ	21
National Automotive Paint File	21
TreadMark	22
SoleMate	22
TreadMate	23

TOPIC	PAGE NO.
Glass Evidence Reference Database	23
Forensic Information System for Handwriting: FISH	24
Ink Libraries	24
International Ink Library	24
Digital Ink Library	25
Direct Analysis in Real Time (DART) Ink Library	25
RxList	26
Ignitable Liquids Reference Collection: ILRC	26
ChemFinder	27
Forensic DB	27
Forensic Accounting Database at University of Baltimore	27
Other New Forensic Software	27
National Databank for Marijuana DNA	28
<i>TABLE 3 PROJECTED U.S. FORENSIC DATABASE PRODUCT REVENUES BY SECTOR, THROUGH 2018 (\$ MILLIONS)</i>	28
ROLE OF FORENSIC SCIENCE IN THE LEGAL SYSTEM	28
PHYSICAL EVIDENCE, COLLECTION AND STORAGE	29
CHAIN OF EVIDENCE OR CUSTODY	30
IMPORTANT TYPES OF EVIDENCE IN LEGAL PROCEEDINGS	30
<i>TABLE 4 PUBLICLY OPERATED CRIME LABORATORIES PERFORMING CERTAIN TYPES OF ANALYSES* (%)</i>	31
ANALYTICAL PROCESSES USED IN FORENSIC TESTING	31
Organic and Inorganic Chemical Analysis	31
Techniques Used in Organic Analysis	32
Techniques Used in Inorganic Analysis	32
MAJOR FORENSIC TESTING AREAS	32
Analysis of Drug- and Toxicology-Related Specimens	33
New Drug Categories-Designer Drugs	33
DNA Profiling and Fingerprinting Products	34
Novel Fingerprint Recovery Techniques	34
Biometric-Based Fingerprint Identification Systems	35
<i>TABLE 5 VENDORS OF BIOMETRIC-BASED FINGERPRINT IDENTIFICATION SYSTEMS, 2013</i>	35
Beyond Simple Fingerprinting: The FBI Next Generation Identification (NGI) Initiative	37
DNA Profiling Market	38
Digital Revolution in Sequencing for All End-Use Markets	38
Expanding Applications of DNA Profiling-Property Crimes	39
Chemical Analysis and Serology	40
Microscopy	40
Detection of Nerve Gas and Other Unusual Compounds	40
ROLE OF NEW TECHNOLOGY IN REDUCING FORENSIC BACKLOGS	41
FORENSIC SCIENCE INSTRUMENTATION	41
<i>TABLE 6 COMPANIES BY MAJOR AREAS OF PARTICIPATION IN ANALYTICAL TESTING</i>	42
CHEMICAL ANALYSIS INSTRUMENTATION	42
DRUG IDENTIFICATION AND TOXICOLOGY ANALYSIS	43
<i>TABLE 7 VENDORS OF DRUG IDENTIFICATION KITS</i>	43
Technologies	44

TOPIC	PAGE NO.
DNA PROFILING	45
NANOTECHNOLOGY	46
FINGERPRINTING/BIOMETRICS	47
<i>TABLE 8 PARTIAL LIST OF SUPPLIERS OF SOLID-STATE FINGERPRINT SCANNERS</i>	48
FORENSIC IMAGING MARKET INCLUDING HANDHELD DEVICES	48
<i>PORTABLE EXPLOSIVES FORENSICS IMAGING DEVICES</i>	49
HANDHELD SPECTRAL DOMAIN OPTICAL COHERENCE TOMOGRAPHY (SD-OCT) IMAGING	50
LAB-ON-A-CHIP PORTABLES	50
<i>PORTABLE CADAVER DETECTION</i>	51
MARKET COMPOSITION	51
GOVERNMENT REGULATION	52
ACCREDITATION	53
<i>TABLE 9 LABORATORY ACCREDITATION STATISTICS (% OF LABORATORIES ACCREDITED BY A PROFESSIONAL ORGANIZATION)</i>	53
GOVERNMENT AGENCIES	53
Bureau of Alcohol, Tobacco, Firearms, and Explosives (ATF)	53
Bomb and Arson Tracking System (BATS)	54
National Integrated Ballistic Information Network—NIBIN	55
National Law Enforcement and Corrections Technology Center (NLECTC)	55
INTERNATIONAL MARKETS	55
MARKET DEMAND	56
TESTING TRENDS	56
<i>TABLE 10 CRIME INDEX TOTALS, 1999-2011 (NUMBER/%)</i>	56
Increase in DNA Testing Workloads	57
<i>TABLE 11 CRIME LABORATORY WORKLOAD STATISTICS, 2005 (CASE REQUESTS)</i>	57
MARKETS FOR FORENSIC ANALYTICAL TECHNIQUES, INSTRUMENTS AND SUPPLIES	57
ORGANIC MATERIALS ANALYSIS	58
Chromatography	58
Applications	58
Supplies	59
<i>TABLE 12 FORENSIC APPLICATIONS BY INSTRUMENT</i>	59
Mass Spectrometers and Chromatography Hyphenated Products	60
Applications	60
Spectrophotometry	61
UV/Visible Spectrophotometry	61
Infrared (IR) Spectrophotometry	61
Spectrophotometry Applications	61
Supplies	62
Immunoassays	62
Applications	62
Enzyme Immunoassays (EIA)	62
Radioimmunoassay (RIA)	63
Fluorescence Polarization Immunoassays (FPIA)	63
Supplies	64
DNA Profiling	64

TOPIC	PAGE NO.
COMBINED DNA INDEX SYSTEM (CODIS)	64
<i>TABLE 13 KEY CODIS DATABASE STATISTICS, 2000-2010</i>	65
INORGANIC MATERIALS ANALYSIS	66
Trace Elemental Analysis	67
Emission Spectroscopy	67
AA Spectrophotometry	67
Neutron Activation	67
X-Ray Diffraction (XRD)	67
GENERAL ANALYTICAL INSTRUMENTS	68
Microscopes	68
Forensic Applications for Microscopes	69
Nanoprobes	70
Fluorescent Light Sources	70
MAJOR ANALYTICAL CATEGORIES	70
Hair Analysis	71
Species and Individual Determination	71
Hair Color and Other Points for Comparison	71
Fiber Analysis	72
Paint Analysis	72
Fire Debris and Explosives Analysis	73
<i>TABLE 14 SIGNIFICANT PRODUCERS OF SPECIALIZED MICROSCOPES USED IN FORENSIC SCIENCES</i>	74
Questioned Document Analysis	74
Customs and Border Protection (CBP) Fraudulent Document Analysis Unit	75
Firearms Identification	76
Ballistic Imaging for Firearms Identification	76
National Integrated Ballistic Identification System (NIBIN)	77
<i>TABLE 15 MOST SUCCESSFUL NIBIN/IBIS PARTNERS</i>	78
New Modalities—Terahertz Rays	78
FORENSIC TESTING MARKET SIZE	78
<i>TABLE 16 PROJECTED U.S. FORENSIC PRODUCT AND SERVICES MARKET BY SEGMENT, THROUGH 2018 (\$ MILLIONS)</i>	79
<i>FIGURE 1 PROJECTED DISTRIBUTION OF U.S. FORENSIC PRODUCT AND SERVICES REVENUES, 2013 VERSUS 2018 (%)</i>	79
ANALYTICAL INSTRUMENTS AND SUPPLIES	80
<i>TABLE 17 PROJECTED U.S. FORENSIC ANALYTICAL INSTRUMENTS AND SUPPLIES MARKET BY TYPE, THROUGH 2018 (\$ MILLIONS)</i>	81
<i>FIGURE 2 PROJECTED U.S. FORENSIC ANALYTICAL INSTRUMENTS AND SUPPLIES MARKET BY TYPE, 2012-2018 (\$ MILLIONS)</i>	81
Numbers and Types of Analytical Instruments in a Typical Forensic Laboratory	82
<i>TABLE 18 PRICES AND NUMBERS OF ANALYTICAL INSTRUMENTS IN FORENSIC LABORATORIES/DEPARTMENTS (\$)</i>	82
Chromatography and Mass Spectrometry	82
<i>TABLE 19 PROJECTED U.S. FORENSIC CHROMATOGRAPHY AND MASS SPECTROMETRY INSTRUMENTS AND SUPPLIES MARKET, THROUGH 2018 (\$ MILLIONS)</i>	82
Analytical Instrument Supply Sales	83

TOPIC	PAGE NO.
Spectrophotometry	84
<i>TABLE 20 PROJECTED U.S. FORENSIC SPECTROPHOTOMETRY INSTRUMENTS MARKET, THROUGH 2018 (\$ MILLIONS/%)</i>	84
Elemental Analysis	84
<i>TABLE 21 PROJECTED U.S. FORENSIC ELEMENTAL ANALYSIS INSTRUMENTS MARKET, THROUGH 2018 (\$ MILLIONS/%)</i>	84
Forensic Microscope Sales	85
<i>TABLE 22 PROJECTED U.S. FORENSIC OPTICAL AND SCANNING ELECTRON MICROSCOPE MARKET, THROUGH 2018 (\$ MILLIONS/%)</i>	85
<i>TABLE 23 OPTICAL MICROSCOPE MANUFACTURERS ESTIMATED MARKET SHARE, 2013 (%)</i>	85
Fluorescent Forensic Light Source Sales	85
<i>TABLE 24 PROJECTED U.S. FORENSIC FLUORESCENT LIGHT SOURCES MARKET, THROUGH 2018 (\$ MILLIONS/%)</i>	86
MARKET PARTICIPANTS-ANALYTICAL INSTRUMENTS	86
<i>TABLE 25 MARKET LEADERS SUPPLYING ANALYTICAL INSTRUMENTS</i>	87
ANALYTICAL INSTRUMENT COMPANY PROFILES	87
Agilent Technologies, Inc.	87
Buck Scientific, Inc.	88
Carl Zeiss	88
Carl Zeiss, Inc.	88
FEI Co.	89
Hitachi High-Technologies Corp.	89
Hitachi High-Technologies America, Inc.	89
Horiba Jobin Yvon, Inc.	90
SPEX Forensics Group	90
Jeol USA, Inc.	90
Leica Microsystems GmbH	91
Melles Griot/Barloworld Scientific Optics Group	91
Nikon Corp.	91
Nikon USA	92
PerkinElmer, Inc.	92
PerkinElmer Life and Analytical Sciences, Inc.	92
Rofin Australia	93
Shimadzu Scientific Instruments, Inc.	93
Spectris, plc	94
PANalytical, Inc.	94
Thermo Fisher Scientific, Inc.	95
Waters Corp.	95
DRUG IDENTIFICATION KITS	96
<i>TABLE 26 ARRESTS BY DRUG TYPE, 2011 (%)</i>	96
DRUG IDENTIFICATION KITS MARKET SIZE	98
<i>TABLE 27 PROJECTED U.S. FORENSIC DRUG IDENTIFICATION KITS MARKET, THROUGH 2018 (\$ MILLIONS)</i>	98
<i>FIGURE 3 PROJECTED U.S. FORENSIC DRUG IDENTIFICATION KITS MARKET 2012-2018 (\$ MILLIONS)</i>	98
MARKET PARTICIPANTS-DRUG IDENTIFICATION KITS	99
MARKET SHARES	99
<i>TABLE 28 ESTIMATED MARKET SHARES OF DRUG KIT COMPANIES, 2010 (%)</i>	99

TOPIC	PAGE NO.
DRUG FIELD TESTING KIT COMPANY PROFILES	99
Microgenics Corp. (Thermo Scientific)	99
Nartec	100
Neogen Corporation	100
NIK/ODV (BAE Systems)	100
ODV, Inc.	100
TOXICOLOGY/IMMUNOASSAY MARKET	101
ALCOHOL ANALYSIS	101
DRUG AND POISON ANALYSIS	102
Drug Analysis	102
Enzyme Immunoassay Screening for Drugs	102
Confirmatory Drug Tests	103
Poison Analysis	103
TOXICOLOGY IMMUNOASSAY REAGENTS	104
THE MARKET FOR FORENSIC TOXICOLOGY TESTING PRODUCTS	104
<i>TABLE 29 PROJECTED U.S. FORENSIC TOXICOLOGY/IMMUNOASSAY MARKET, THROUGH 2018 (\$ MILLIONS)</i>	105
<i>FIGURE 4 PROJECTED U.S. FORENSIC TOXICOLOGY/IMMUNOASSAY MARKET, 2012-2018 (\$ MILLIONS)</i>	105
Market Share	105
<i>TABLE 30 FORENSIC IMMUNOASSAY TESTING PARTICIPANTS, ESTIMATED MARKET SHARE, 2012 (%)</i>	105
IMMUNOASSAY COMPANY PROFILES	106
Abbott Laboratories	106
Dade Behring, Inc.	106
Roche Diagnostics Systems	106
Siemens Medical Solutions Diagnostics	106
FORENSIC BIOLOGY AND SEROLOGY	107
BLOOD GROUPING	107
SEROLOGICAL CHARACTERIZATION OF BLOODSTAINS	107
Preliminary Color Tests	107
Confirmatory and Species Determination Tests	108
Serological Characterization of Semen	108
PATTERN ANALYSIS OF BLOODSTAINS	108
BONE FORENSICS AND SKELETAL BIOLOGY	109
MARKET SIZE	109
<i>TABLE 31 PROJECTED U.S. FORENSIC BIOLOGY AND SEROLOGY TESTING MARKET, THROUGH 2018 (\$ MILLIONS)</i>	109
<i>FIGURE 5 PROJECTED U.S. FORENSIC BIOLOGY AND SEROLOGY TESTING MARKET, 2012 TO 2018 (\$ MILLIONS)</i>	110
FORENSIC BIOLOGY AND SEROLOGY TESTING COMPANY PROFILE	110
Abacus Diagnostics	110
FINGERPRINTING/BIOMETRICS	110
FINGERPRINT RIDGES AND RIDGE CHARACTERISTICS	111
FINGERPRINT CLASSIFICATION	111
Henry and FBI Systems for Classifying, Storing, Retrieving and Searching for Fingerprints	111
INTEGRATED AUTOMATED FINGERPRINT IDENTIFICATION SYSTEMS (IAFIS)	112

TOPIC	PAGE NO.
IAFIS ENHANCEMENTS: AUTOMATIC FEATURE EXTRACTION AND MATCHING (AFEM)	113
PRODUCT TYPES AND APPLICATIONS	114
<i>TABLE 32 FINGERPRINTING APPLICATIONS, PRODUCT TYPES AND SUPPLIERS</i>	115
PRODUCTS FOR OBTAINING KNOWN OR CRIMINAL 10-PRINTS AND THEIR SUPPLIERS	115
Methods and Products Involving Ink	115
Semi-Inkless and Inkless Methods	116
10-Print Fingerprint Cards	116
Electronic	116
Live Scan Products	116
<i>TABLE 33 COMPLETE LIST OF LIVE SCAN FINGERPRINT SYSTEM MANUFACTURERS</i>	117
Card Scan Products	118
<i>TABLE 34 COMPLETE LIST OF CARD SCAN FINGERPRINT SYSTEM MANUFACTURERS</i>	119
Portable Mobile ID Fingerprint Scan Products	120
<i>TABLE 35 PORTABLE MOBILE ID FINGERPRINT SCAN PRODUCTS AND VENDORS</i>	120
Printers Used in Conjunction with Above Systems	121
PRODUCTS FOR DEVELOPING AND PRESERVING CRIME SCENE PRINTS AND THEIR SUPPLIERS	121
Fingerprint Powders for Prints on Hard, Nonporous Substances	121
Chemical Products Used to Recover Prints	122
Super Glue Fuming and Other Products to Recover Prints on Metal, Tape, Leather and Plastic	122
Chemical Products for Use on Soft and Porous Substances such as Paper and Wood	123
Iodine Fuming	123
Ninhydrin	123
Silver Nitrate	123
Fluorescent Chemicals for Print Visualization	123
Miscellaneous Chemical Products	124
Products to Preserve Crime Scene Prints	124
Lifting Tape and Backing Cards	124
PHOTOGRAPHY SUPPLIES	124
MAGNIFIERS	124
DIGITAL IMAGING ENHANCEMENT SOFTWARE	124
AFIS Vendors	125
MARKET SIZE	126
<i>TABLE 36 PROJECTED U.S. FORENSIC FINGERPRINTING MARKET BY PRODUCT TYPE, THROUGH 2018 (\$ MILLIONS)</i>	126
<i>FIGURE 6 PROJECTED U.S. FORENSIC FINGERPRINTING MARKET BY PRODUCT TYPE, 2012-2018 (\$ MILLIONS)</i>	126
<i>TABLE 37 PRICING COSTS PER UNIT FOR FINGERPRINT SYSTEMS AND SUPPLIES (\$)</i>	127
MARKET FOR 10-PRINT PRODUCTS	128
<i>TABLE 38 ESTIMATED NUMBER OF CRIMINAL FINGERPRINT CARDS SUBMITTED TO THE FBI, THROUGH 2011</i>	129
MARKET FOR ELECTRONIC PRODUCTS	129
MARKET FOR CRIME SCENE PRINT PRODUCTS	130
MARKET FOR AFIS	130
NEC Systems	130

TOPIC	PAGE NO.
FINGERPRINTING PRODUCT COMPANY PROFILES	131
Forensics Source	131
Lightning Powder Co., Inc.	131
Arrowhead Forensic Products	132
L-1 Identity Solutions, Inc.	132
NEC Corporation of America	132
MorphoTrak	132
Sirchie Finger Print Labs, Inc.	133
Tri-Tech Forensics	133
DNA TESTING	133
APPLICATIONS AND GROWTH RATE	133
SHORT TANDEM REPEATS	134
STR Technology Development	135
Advances in Sample Preparation	136
OVERSEAS ACTIVITIES	136
<i>TABLE 39 STATUS OF EUROPEAN UNION MEMBER STATE DNA DATABASES, DATABASE ENTRY CRITERIA BY COUNTRY, 2013</i>	137
INTERPOL GLOBAL DNA PROFILING DATA	138
DNA TESTING METHODS	139
Separation/Extraction/Amplification Methods	139
<i>TABLE 40 USE RATES FOR AMPLIFICATION KITS, 2005 (NO./%)</i>	140
RFLP	140
PCR	140
PCR Kit Market	140
<i>TABLE 41 MOST FREQUENTLY USED PCR KITS BY VENDOR</i>	141
AmpFLSTR Profiler Plus PCR Amplification Kit	141
AmpFLSTR COfiler PCR Amplification Kit	141
Typing Kits	141
AmpliType DQA1 Typing System Kit	141
AmpliType Polymarker (PM) PCR Typing System	142
<i>TABLE 42 EXAMPLES OF APPLIED BIOSYSTEMS DNA KITS</i>	142
STR ANALYSIS (STR)	143
MITOCHONDRIAL DNA ANALYSIS (MTDNA)	143
mtDNA and the National Missing Persons DNA Database (NMPDD)	144
Y-CHROMOSOME ANALYSIS	145
LOW COPY NUMBER (LCN) DNA	145
ANALYTICAL INSTRUMENTATION	145
Applied Biosystems AutoMate Express Forensic DNA Extraction System	146
Lockheed Martin/ZyGEM Rapl.D.	146
MultiProbe II: PerkinElmer Forensic Workstation	147
Sequencing Analyzers	147
<i>TABLE 43 SEQUENCING ANALYZER PLACEMENTS IN DNA TESTING LABORATORIES, 2002 (RESPONSE FROM 106 FACILITIES)</i>	147
The ABI Prism 310	147
ABI Prism 377	148
Hitachi FMBIO II	148
Robotics	148

TOPIC	PAGE NO.
Expert Systems	148
<i>TABLE 44 NDIS APPROVED EXPERT SYSTEMS</i>	149
DNA TESTING PRODUCTS, KITS AND AUTOMATION COMPANY PROFILES	150
Applied Biosystems	150
Forensic ID	150
Hitachi Software Engineering America, Ltd.	150
Pacific Biosciences of California, Inc.	151
PerkinElmer Corp.	151
Promega Corporation	152
DNA MATCHING	152
CODIS	153
DNA IDENTIFICATION ACT OF 1994	153
THE ROLE OF DNA EVIDENCE IN LAW ENFORCEMENT AND IN THE LEGAL SYSTEM TODAY	153
LABORATORIES PERFORMING DNA ANALYSIS	154
Public Laboratories	154
<i>TABLE 45 CASE WORKLOAD STATISTICS, 1999 AND 2000</i>	154
Private Laboratories Performing DNA Analysis	154
PRIVATE DNA LABORATORY AND KIT PROVIDER COMPANY PROFILES	155
Affymetrix, Inc.	155
The Bode Technology Group, Inc.	155
DNA Diagnostics Center	156
DNA: SI	156
Illumina, Inc.	157
Key Forensic Services	157
Life Technologies	157
Nexttec GmbH Biotechnologie	158
Orchid Cellmark	158
Paternity Testing Corporation	159
Promega Corporation	159
Sorenson Forensics	159
Qiagen N.V.	160
Warnex PRO-DNA Services	160
MARKET SIZE	161
FEDERAL SPENDING ON DNA BACKLOG REDUCTION PROGRAM	162
<i>TABLE 46 FEDERAL FUNDING FOR THE DNA TESTING BACKLOG REDUCTION PROGRAM, 2004-2010 (\$ THOUSANDS)</i>	163
<i>TABLE 47 PROJECTED U.S. FORENSIC DNA TESTING CONVICTED OFFENDER, ARRESTEE AND CASE DATA COMPLETED TESTS, 2007-2016 (MILLIONS)</i>	163
<i>TABLE 48 PROJECTED U.S. FORENSIC DNA TESTING MARKET BY PRODUCT TYPE, THROUGH 2018 (\$ MILLIONS)</i>	163
FUTURE ADVANCES IN DNA PROFILING	163
DNA Chip Technology	163
Microbial Forensics	165
FORENSIC DNA RESEARCH PRIORITIES	166
General Improvements to the Front End of the Forensic DNA Analysis Process	166
Physical Separation of the Components of a Mixture	166

TOPIC	PAGE NO.
Body Fluid/Cell Type Identification and Characterization	167
Identification and/or Characterization of Genetic Markers	167
Improve Tools for Examining Aged, Degraded, Limited, Damaged, Inhibited or Otherwise Compromised DNA Evidence	167
Species Differentiation	167
Novel Approaches for Genetic Profiling	167
Software Tools for Mixture Interpretation of DNA Data from Casework Samples	168
Automated Sperm Searches	168
National Institute of Justice Forensic Research R&D Priorities	168
<i>TABLE 49 FORENSIC DNA RESEARCH AND DEVELOPMENT</i>	169
Familial DNA Matches and Crime Solving	175
SEQUENCING SOFTWARE	176
CHAPTER 4 TECHNOLOGY	178
TECHNIQUES USED TO ANALYZE ORGANIC FORENSIC EVIDENCE	178
CHROMATOGRAPHY	178
Chromatography Description	178
Chromatography System Types Used in Forensics	178
Gas Chromatography (GC)	178
<i>FIGURE 7 GAS CHROMATOGRAPHY SCHEMATIC DIAGRAM</i>	179
Headspace GC	180
High-Performance Liquid Chromatography	180
Thin-layer Chromatography (TLC)	181
MASS SPECTROMETERS AND CHROMATOGRAPHY- HYPHENATED PRODUCTS	181
Mass Spectrometry	181
<i>FIGURE 8 MASS SPECTROMETER</i>	181
Hyphenated MS/Chromatography Systems Used in Forensics	182
<i>FIGURE 9 HYPHENATED SPECTROSCOPY TECHNIQUES</i>	183
SPECTROPHOTOMETRY	183
UV/Visible Spectrophotometry	184
<i>FIGURE 10 UV/VISIBLE SPECTROSCOPE SCHEMATIC DIAGRAM</i>	184
Infrared (IR) Spectrophotometry	185
<i>FIGURE 11 PRINCIPAL ELEMENTS OF AN IR SPECTROMETER</i>	185
Fourier Transform Infrared Spectrometers (FT-IR)	185
<i>FIGURE 12 ELEMENTS OF AN FT-IR SPECTROMETER</i>	186
IMMUNOASSAY	186
Enzyme Immunoassay (EIA)	186
Basic EIA	187
<i>FIGURE 13 THE BASIC ENZYME IMMUNOASSAY (EIA) PROCESS</i>	187
Alternate EIA Methods	187
Second-Antibody Precipitation Method	187
Double-Antibody Sandwich Method	188
Reverse-Sandwich Method	188
Reverse-Sandwich Inhibition Method	188
Immunoanalysis Instruments	188
TECHNIQUES USED TO ANALYZE INORGANIC FORENSIC EVIDENCE	189

TOPIC	PAGE NO.
EMISSION SPECTROSCOPY	189
ATOMIC ABSORPTION (AA) SPECTROPHOTOMETRY	189
<i>FIGURE 14 PRINCIPAL ELEMENTS OF AN ATOMIC ABSORPTION SPECTROMETER</i>	190
NEUTRON ACTIVATION ANALYSIS	190
TECHNIQUES FOR DETERMINING THE IDENTITY OF FORENSIC EVIDENCE	191
GENERAL ANALYTICAL INSTRUMENTS USED FOR FORENSICS AND APPLICATIONS	191
Microscopes	191
Compound Microscopes	191
Comparison Microscopes	191
Stereoscopic Microscopes	191
Polarized Microscopes	191
Microspectrophotometers	192
Scanning Electron Microscopes (SEMs)	192
SERS Nanoprobe	193
FLUORESCENT LIGHT SOURCES	193
FIREARMS IDENTIFICATION SYSTEMS	194
Integrated Ballistics Identification System (IBIS)	194
ALIAS-Pyramidal Technologies	194
DNA PROFILING	195
Extraction and Quantification of DNA and Suppliers	195
Restriction Fragment Length Polymorphism (RFLP) Method for DNA Profiling	195
Polymerase Chain Reaction (PCR) DNA Profiling	196
PCR vs. RFLP/Southern Analysis	196
The PCR Process	196
<i>FIGURE 15 THE PCR PROCESS</i>	197
PCR Systems Used in Forensic DNA Profiling and Their Suppliers	197
7500 Real-Time PCR System	197
JANUS Forensic Workstation	198
DQA1 System	198
AmpliType Polymarker (PM) PCR Typing System	198
Newer Real-Time PCR Typing Systems	199
Short Tandem Repeat (STR) Typing	199
STR vs. RFLP and Previously Described PCR Profiling Types	199
Description of STRs and the Profiling Procedure	199
STR Systems Used, Suppliers and the Status of STR Testing	200
Mitochondrial DNA Profiling	200
DNA Chip Technology	201
The Future of DNA Typing Systems	201
<i>TABLE 50 RESEARCH AND DEVELOPMENT PRIORITIES IN THE USE OF DNA FOR FORENSIC IDENTIFICATION</i>	202
CHAPTER 5 OTHER FORENSICS SCIENCE MARKET SEGMENTS	204
OVERVIEW	204
DIGITAL EVIDENCE	204
TRENDS IN DIGITAL EVIDENCE	205
FORENSIC ANALYSIS OF CYBER ATTACKS	206

TOPIC	PAGE NO.
MANY NEW MARKET ENTRANTS	207
THE MARKET FOR DIGITAL PHOTOGRAPHY	208
DIGITAL VERSUS CONVENTIONAL PHOTOGRAPHY	208
<i>TABLE 51 PRINCIPAL APPLICATION AREAS FOR UV-IR FORENSIC PHOTOGRAPHY</i>	209
Cost and Time Savings with Digital Photography	210
CYBERCRIME AND COMPUTER EVIDENCE DISCOVERY	210
NEW TECHNOLOGY ISSUES SEVERELY IMPACT COMPUTER FORENSICS	212
Department of Defense Computer Forensics Laboratory (DCFL)	213
Private Sector	213
FORENSIC IMAGE PROCESSING	214
GOVERNMENT FORENSICS LABS INITIATIVES	215
<i>TABLE 52 RCFL PROGRAM HIGHLIGHTS, 2003-2009</i>	215
<i>TABLE 53 EXAMPLES OF NATIONAL SCIENCE FOUNDATION FUNDING FOR COMPUTER FORENSICS RESEARCH (\$)</i>	216
NEW FORENSIC TOOLS	219
CELL PHONE FORENSICS	219
OTHER PDAS	220
<i>TABLE 54 PDA FORENSIC TOOLS</i>	221
Palm dd (pdd)	221
Pilot-Link	222
POSE	222
PDA Seizure	222
EnCase	222
Duplicate Disk (dd)	223
COMPUTER EVIDENCE COMPANY PROFILES	223
Ace Data Group, LLC	223
Capsicum Group	223
Cellebrite USA Inc.	224
Center for Computer Forensics	224
Computer Forensics, Inc.	224
Computer Forensics Labs, Inc. (CFL)	225
Computer Forensics Services (CFS)	225
Creative Forensic Services	225
Cyber Agents, Inc.	225
CyberEvidence, Inc.	226
CY4OR	226
Data Discovery	226
Data Recon, LLC	226
Datarecovery.com, Inc.	227
Digital Mountain, Inc.	227
Digitalmedix, Inc.	227
DTI	227
E-Fense, Inc.	228
eMag Solutions, LLC	228
Flashback Data, LLC	228
ForenSec, Ltd.	228
Forensicon, Inc.	229
Global Digital Forensics	229

TOPIC	PAGE NO.
Great Scott Enterprises	229
Guidance Software, Inc.	229
i2, Inc.	230
IntaForensics, Ltd.	230
Kroll Ontrack	230
LC Technology International, Inc.	231
Lightstone Solutions	231
LuciData, LLC	231
Mantech International Corp.	231
Midwest Data Group	232
Norcross Group	232
Palmer Legal Technologies	232
PricewaterhouseCoopers LLP	233
Protiviti	233
Project Leadership Associates	233
Renew Data	233
Sapphire Technologies	234
Sector Forensics	234
Setec Investigations	234
Tunstall and Tunstall, Inc.	235
UBIC Japan	235
UBIC North America, Inc.	235
Vogon International LLC	235
7SAFE	236
COMPUTER FORENSIC TOOLS	236
FORENSIC ACCOUNTING	236
LABORATORY INFORMATION MANAGEMENT SYSTEMS (LIMS)	237
<i>TABLE 55 PERCENT OF CRIME LABORATORIES WITH LIMS BY TYPE OF JURISDICTION, 2002-2009 (%)</i>	237
BAR CODING AND EVIDENCE TRACKING	239
EXAMPLES OF LIMS SYSTEMS	239
Labtronics	239
Crime Fighter Beast	239
JusticeTrax LIMS	239
LABLynx EMedex	240
Promadis Caseman	240
Themis LIMS	240
StarFruit CrimeLab LIMS	240
StarLIMS	241
SOFTWARE FORENSICS TOOLS	241
FORENSIC PALYNOLOGY	241
POTENTIAL REVENUE FROM RELATED PRODUCTS	242
<i>TABLE 56 ESTIMATED ANNUAL REVENUES FROM RELATED PRODUCTS, 2013 (\$ MILLIONS)</i>	242
CHAPTER 6 PATENTS	244
SIGNIFICANCE OF PATENTS	244
EXAMINATION OF RECENTLY ISSUED PATENTS	244

TOPIC	PAGE NO.
<i>TABLE 57 FORENSIC PATENTS BY CLASSIFICATION, 2008-2013</i>	244
LENGTH OF TIME FROM FILING TO APPROVAL	245
<i>TABLE 58 LENGTH OF TIME FROM PATENT FILING TO APPROVAL 2008-MID-2013</i>	245
COMPANIES RECEIVING PATENTS	245
<i>TABLE 59 RECENTLY ISSUED FORENSIC PATENTS BY INVENTOR/ASSIGNEE, SAMPLE DURING, 2008-MID-2013</i>	245
SELECTED PATENT ABSTRACTS	246
DATABASES FOR RRNA GENE PROFILING OF MICROBIAL COMMUNITIES	246
REMOTE COLLECTION OF COMPUTER FORENSIC EVIDENCE	246
ENTERPRISE COMPUTER INVESTIGATION SYSTEM	246
DIGITAL FORENSIC ANALYSIS USING EMPIRICAL PRIVILEGE PROFILING (EPP) FOR FILTERING COLLECTED DATA	247
DIGITAL FORENSIC ANALYSIS USING EMPIRICAL PRIVILEGE PROFILING (EPP) FOR FILTERING COLLECTED DATA	247
AUTOMATED FORENSIC DOCUMENT SIGNATURES	248
XANTHENE DYES COMPRISING A SULFONAMIDE GROUP	248
METHOD FOR DETERMINING HARD DRIVE CONTENTS THROUGH STATISTICAL DRIVE SAMPLING	249
METHODS FOR RAPID MULTIPLEXED AMPLIFICATION OF TARGET NUCLEIC ACIDS	249
AUTOMATED COLLECTION OF FORENSIC EVIDENCE ASSOCIATED WITH A NETWORK SECURITY INCIDENT	249
SYSTEM FOR ANALYZING FORENSIC EVIDENCE USING IMAGE FILTER AND METHOD THEREOF	250
COMPOSITIONS AND METHODS FOR CDNA SYNTHESIS	250
METHODS FOR RAPID FORENSIC ANALYSIS OF MITOCHONDRIAL DNA	251
FORENSIC IDENTIFICATION	251
KEYBOARD, MOUSE, AND VIDEO (KVM) SESSION CAPTURE SYSTEM THAT STORES AND CAN PLAYBACK PORTIONS OF LIVE KVM SESSION VIA FORENSIC CAPTURE MODULE	251
COMPOSITIONS AND METHODS FOR REVERSE TRANSCRIPTASE-POLYMERASE CHAIN REACTION (RT-PCR)	252
EFFICIENT AND SECURE FORENSIC MARKING IN COMPRESSED DOMAIN	252
FINGERPRINT SCANNING SYSTEMS AND METHODS	253
FRAGMENTED DATA FILE FORENSIC RECOVERY SYSTEM AND METHOD	253
COMPUTER SYSTEM AND COMPUTER-FACILITATED METHOD FOR NUCLEIC ACID SEQUENCE ALIGNMENT AND ANALYSIS	254
METHODS FOR IDENTIFYING BIOAGENTS	254
METHODS FOR SEARCHING FORENSIC DATA	254
FORENSIC TOOLKIT AND METHOD FOR ACCESSING DATA STORED ON ELECTRONIC SMART CARDS	255
FORENSIC TEST STRIP AND METHOD FOR THE DETECTION OF SEMEN	255
FORENSIC INTEGRATED SEARCH TECHNOLOGY WITH INSTRUMENT WEIGHT FACTOR DETERMINATION	256
METHODS, PANELS OF IDENTIFICATION MARKERS, AND KITS FOR IDENTIFYING FORENSIC SAMPLES	256
SYSTEM AND METHOD FOR COLLECTING DNA AND FINGERPRINTS	257
METHODS, PANELS OF IDENTIFICATION MARKERS, AND KITS FOR IDENTIFYING FORENSIC SAMPLES	257
ADAPTIVELY COLLECTING NETWORK EVENT FORENSIC DATA	257

TOPIC	PAGE NO.
METHODS AND APPARATUSES FOR SORTING OBJECTS IN FORENSIC DNA ANALYSIS AND MEDICAL DIAGNOSTICS	258
FORENSIC SYSTEMS AND METHODS USING SEARCH PACKS THAT CAN BE EDITED FOR ENTERPRISE-WIDE DATA IDENTIFICATION, DATA SHARING, AND MANAGEMENT	258
COMPOSITIONS AND METHODS FOR REVERSE TRANSCRIPTASE-POLYMERASE CHAIN REACTION (RT-PCR)	259
METHOD OF INDEXED STORAGE AND RETRIEVAL OF MULTIDIMENSIONAL INFORMATION	259
PROGRESSIVE LAYERED FORENSIC CORRELATION OF COMPUTER NETWORK AND SECURITY EVENTS	260
DETECTION OF LATENT PRINTS BY RAMAN IMAGING	260
DROPLET-BASED NUCLEIC ACID AMPLIFICATION METHOD AND APPARATUS	260
HELICASE-DEPENDENT AMPLIFICATION OF NUCLEIC ACIDS	261
METHOD AND APPARATUS FOR ALIGNMENT, COMPARISON AND IDENTIFICATION OF CHARACTERISTIC TOOL MARKS, INCLUDING BALLISTIC SIGNATURES	261
CAPTURING AIR SAMPLES FOR FORENSIC INVESTIGATION	262
COMPLEXITY MANAGEMENT OF GENOMIC DNA	262
METHODS FOR RAPID FORENSIC ANALYSIS OF MITOCHONDRIAL DNA AND CHARACTERIZATION OF MITOCHONDRIAL DNA HETEROPLASMY	263
CHAPTER 7 COMPANY CONTACT INFORMATION AND PRODUCT FOCUS MATRIX	265
<i>TABLE 60 COMPANY CONTACT INFORMATION AND PRODUCT FOCUS MATRIX</i>	265
CHAPTER 8 APPENDIX 1	271
DNA DATA BANK LAWS BY STATE IN EFFECT AS OF AUGUST 2013 (COLLECTED BY THE NATIONAL CONFERENCE OF STATE LEGISLATURES)	271
<i>TABLE 61 STATUS OF STATE LAWS ON DNA DATABANKS (CIRCUMSTANCES UNDER WHICH SAMPLES ARE REQUIRED)</i>	271
SURREPTITIOUS DNA TESTING	276
Alaska HB 49	276
Arizona HB 2021 B	276
Arkansas HB 1074 B	276
Arkansas HB 2310 B	277
California AB 898 B	277
Colorado SB 164 B	277
Connecticut H 5022 B	277
Delaware SB 38 B	277
Florida SB 1648 B	278
Georgia S 119 B	278
Illinois SB 280 B	278
Louisiana SB 295 B	278
Louisiana SB 346 B	278
Louisiana SB 522 B	278
Maine H 300 B	278
Maryland SB 363 B	279
Michigan HB 4746 B	279
Michigan SB 444 B	279
Minnesota SB 239 B	279

TOPIC	PAGE NO.
Minnesota SB 942 B	279
Mississippi SB 2348 B	279
Montana SB 183 B	279
Nevada A 55 B	280
Nevada AB 16 B	280
New Jersey AB 2617 B	280
New Hampshire H 215 B	280
New Mexico SB 184 B	280
North Carolina HB 79 B	280
North Carolina HB 79 B	280
North Dakota HB 1235 B	281
Ohio SB 11 B	281
Oklahoma HB 1802 B	281
South Dakota SB 184 B	281
Texas H 2703 B	281
Texas H 562 B	281
Texas HB 2703 B	281
Utah SB 116 B	281
Utah HB 107 B	282
Virginia H 2661 B	282
Washington HB 1391 B	282
CHAPTER 9 APPENDIX 2	284
PARTIAL LISTING OF PRINCIPAL FORENSIC CRIME LABORATORIES IN THE UNITED STATES	284
ALABAMA	284
Alabama Department of Forensic Sciences	284
ALASKA	284
Alaska State Crime Laboratory	284
ARIZONA	284
Arizona Department of Public Safety	284
Tucson Police Dept.	284
Mesa Police Dept.	285
Phoenix Police Dept.	285
Scottsdale Police Dept.	285
ARKANSAS	285
Arkansas State Crime Laboratory	285
CALIFORNIA	285
State Police Laboratory	285
Orange County Sheriff-Coroner/Forensic Science Services	286
San Bernardino County Sheriff's Dept.	286
University of California	286
California Department of Justice	286
Office of the Sheriff	286
Oakland Police Dept.	287
California Department of Justice	287
California Department of Justice	287
Fresno Regional Laboratory	287

TOPIC	PAGE NO.
Alameda County Sheriff's Office	287
Los Angeles County Sheriff's Dept.	287
San Diego PD	288
Sheriff's Crime Laboratory	288
District Attorney's Office	288
San Francisco PD	288
Forensic Services Division	288
Kern County Crime Lab	288
Sacramento County DA Crime Lab	288
San Mateo County Crime Lab	288
Santa Clara DA	289
Ventura Crime Lab	289
California Department of Justice	289
Huntington Beach Police Dept.	289
Los Angeles Police Dept.	289
COLORADO	289
Department of Justice	289
Colorado Bureau of Investigation	289
Denver Police Dept	290
CONNECTICUT	290
Connecticut State Police	290
DELAWARE	290
Office of the Chief Medical Examiner	290
Delaware State Police Crime Lab	290
FLORIDA	290
Broward County Sheriff's Office	290
Manatee County Sheriff's Office	291
Miami-Dade Police Forensic Laboratory	291
Palm Beach Sheriff's Office	291
Florida Department of Law Enforcement	291
Palm Beach County	291
Florida Department of Law Enforcement Crime Lab	291
Regional Crime Lab @ IRCC	292
GEORGIA	292
Georgia Bureau of Investigation	292
GBI Western Regional Crime Lab	292
U. S. Army Criminal Investigation Laboratory (USACIL)	292
HAWAII	292
Honolulu PD (CODIS)	292
IDAHO	293
Idaho State Police Forensic Services	293
ILLINOIS	293
Rockford Forensic Science Laboratory	293
Forensic Science Center at Chicago	293
Westchester Forensic Science Laboratory	293
Joliet Forensic Science Laboratory	293
Morton Forensic Science Laboratory	293

TOPIC	PAGE NO.
Springfield Forensic Science Laboratory	294
Metro-East Forensic Science Laboratory	294
DuPont County Sheriff's Office	294
Northern Illinois Sheriff's Office	294
Southern Illinois Forensic Science Centre	294
Illinois State Police	294
INDIANA	294
Indianapolis-Marion County	294
Indiana State Police	295
Johnson County Sheriff's Office	295
IOWA	295
Criminalistics Laboratory, Division of Criminal Investigation, Iowa State	295
Iowa Department of Public Safety	295
KANSAS	295
Kansas Bureau of Investigation	295
Sedgwick County Regional Forensic Science Center	296
Kansas City Police Dept.	296
KENTUCKY	296
Kentucky State Police	296
Western Regional Forensic Laboratory	296
Jefferson Regional Forensic Laboratory	296
Northern Regional Forensic Laboratory	297
Eastern Regional Forensic Laboratory	297
Southeastern Regional Forensic Laboratory	297
LOUISIANA	297
South West Louisiana Criminalistics Laboratory	297
Acadiana Criminalistics Laboratory	297
Crime Laboratory	297
North Louisiana Crime Laboratory	298
New Orleans PD	298
MAINE	298
Maine State Police Crime Laboratory	298
MARYLAND	298
DOD DNA Registry	298
Maryland State Police	298
Baltimore City PD	298
Baltimore County PD	299
Montgomery County PD	299
Anne Arundel County PD	299
Prince George's County PD	299
Prince George's County Police Dept.	299
MASSACHUSETTS	299
Massachusetts Department of Public Safety	299
Boston PD	300
MINNESOTA	300
The BCA Forensic Science Laboratory	300
Crime Laboratory, Saint Paul Police	300

TOPIC	PAGE NO.
Minnesota Bureau of Criminal Apprehension	300
MISSISSIPPI	300
The Mississippi Crime Laboratory (MCL) System	300
MICHIGAN	300
Oakland County Sheriff's Dept.	300
Michigan State Police	301
Detroit PD	301
MISSOURI	301
Missouri State Police	301
Southeast Missouri Regional Crime Lab	301
St. Louis Metropolitan Police Dept.	301
St. Louis County PD	301
Kansas City Police	301
Missouri State Highway Patrol	302
St. Charles Co. Sheriff's Dept.	302
MONTANA	302
Montana Department of Justice	302
NEBRASKA	302
The Nebraska State Patrol Crime Lab	302
NEVADA	302
Washoe Co. Sheriff Forensic Science Division	302
Las Vegas Metropolitan PD Forensic Lab	303
Nevada Department of Public Safety	303
NEW HAMPSHIRE	303
New Hampshire State Police	303
NEW JERSEY	303
New Jersey State Police	303
New Jersey State Police Forensic Science Laboratory Bureau	303
Burlington County Crime Laboratory	303
Cape May County Prosecutor's Office	304
Hudson County Prosecutor's Office	304
New Jersey State Police	304
Union County Prosecutor's Office	304
Newark Police Dept.	304
NEW MEXICO	304
The New Mexico Department of Public Safety Crime Laboratory	304
Southern Crime Lab	305
Albuquerque PD (CODIS)	305
Department of Public Safety	305
NEW YORK	305
Yonkers Police Dept.	305
New York State Police: Western Regional Crime Laboratory	305
New York State Police: Southern Tier Regional Crime Laboratory	305
NYC-Office of the Chief Medical Examiner	306
New York State Police	306
Erie County Forensic Laboratory	306
Niagara County Sheriff's Department Forensic Laboratory	306

TOPIC	PAGE NO.
Office of Chief Medical Examiner	306
Suffolk County Crime Laboratory	306
Westchester County	307
Onandaga County	307
Monroe County Laboratory	307
Nassau County ME	307
New York State Division of Criminal Justice Services	307
NORTH CAROLINA	307
North Carolina State Bureau of Investigation Crime Laboratory	307
Charlotte-Mecklenburg	308
NORTH DAKOTA	308
North Dakota Crime Laboratory	308
State Crime Lab	308
OHIO	308
Miami Valley Regional Crime Laboratory	308
Hamilton County Coroner's Office	308
Ohio Bureau of Criminal Identification & Investigation	308
Ohio Attorney General's Office	308
Ohio Department of Public Safety	309
Cuyahoga County Coroner's Office	309
Lake County	309
Mansfield PD	309
OKLAHOMA	309
Criminalistics Services	309
Central Latent Evidence Laboratory	309
Lawton Regional Laboratory	309
Tahlequah Regional Laboratory	310
Central Laboratory	310
Enid Regional Laboratory	310
McAlester Regional Laboratory	310
Tulsa Police Dept.	310
OREGON	310
Oregon State Police Laboratory	310
Oregon State Forensic Services Div.	310
Washington County Sheriff's Office Forensic Science Unit	311
PENNSYLVANIA	311
The Forensic Identification Unit	311
Pennsylvania State Police	311
Allegheny County Crime Lab	311
Philadelphia PD	311
RHODE ISLAND	311
The Rhode Island State Crime Laboratory	311
Rhode Island Department of Health	312
SOUTH CAROLINA	312
South Carolina Law Enforcement Div.	312
Richland County	312
Orangeburg PD	312

TOPIC	PAGE NO.
Administrative Bureau of Charleston Police Dept.	312
SOUTH DAKOTA	312
South Dakota Division of Criminal Investigation	312
TENNESSEE	313
Tennessee Bureau of Investigation	313
Forensic Sciences Center	313
TEXAS	313
Texas Department of Public Safety	313
Texas Dept. of Public Safety	313
The Bexar County Forensic Toxicology Laboratory (FTL)	313
Houston PD	313
Southwest Institute of Forensic Science	314
Texas DPS	314
Harris County Medical Examiner's Office	314
Tarrant County ME	314
Fort Worth Police Dept.	314
UTAH	314
Utah Department of Public Safety, Bureau of Forensic Services	314
VERMONT	315
Vermont Forensic Laboratory	315
VIRGINIA	315
Commonwealth of Virginia	315
Virginia Division of Forensic Science	315
WASHINGTON	315
Washington State Patrol	315
Washington State Patrol	315
WASHINGTON, DC	316
FBI Laboratory	316
National Institute of Justice FBI Laboratory	316
Washington Metro Police	316
WEST VIRGINIA	316
Office of the Chief Medical Examiner, North Central Region	316
West Virginia State Police Forensic Laboratory 25 Jefferson Rd. South Charleston, WV 25309	316
Marshall University	316
WISCONSIN	317
The Wisconsin Crime Lab System	317
State Crime Lab	317
WYOMING	317
Wyoming State Crime Laboratory	317
Wyoming Division of Criminal Investigation	317
CHAPTER 10 APPENDIX 3	319
SELECT FORENSIC CONSULTING FIRMS	319
AMERICAN MEDICAL FORENSIC SPECIALISTS, INC.	319
EVIDENCE PHOTOGRAPHERS INTERNATIONAL COUNCIL, INC.	319
FORENSIC ANALYTICAL SCIENCES, INC.	319
FORENSIC SCIENCE ASSOCIATES	320

TOPIC	PAGE NO.
FTI CONSULTING, INC.	320
LWG CONSULTING	320
ROBERT F. JENNINGS FORENSIC SERVICES	321
RUHL FORENSIC, INC.	321
CHAPTER 11 APPENDIX 4	323
FORENSIC TRADE SHOWS	323
<i>TABLE 62 ORGANIZATIONS THAT REGULARLY SPONSOR FORENSIC TRADE SHOWS, 2014 CALENDAR</i>	323

LIST OF TABLES

TABLE HEADING	PAGE NO.
SUMMARY TABLE MAJOR U.S. FORENSIC PRODUCTS AND SERVICES MARKET SEGMENTS FORECAST, THROUGH 2018 (\$ MILLIONS)	8
TABLE 1 PERCENTAGE OF U.S. LABORATORIES PERFORMING VARIOUS FORENSIC FUNCTIONS (%)	15
TABLE 2 STATES WITH FORENSIC OVERSIGHT BOARDS, 2013	17
TABLE 3 PROJECTED U.S. FORENSIC DATABASE PRODUCT REVENUES BY SECTOR, THROUGH 2018 (\$ MILLIONS)	28
TABLE 4 PUBLICLY OPERATED CRIME LABORATORIES PERFORMING CERTAIN TYPES OF ANALYSES* (%)	31
TABLE 5 VENDORS OF BIOMETRIC-BASED FINGERPRINT IDENTIFICATION SYSTEMS, 2013	35
TABLE 6 COMPANIES BY MAJOR AREAS OF PARTICIPATION IN ANALYTICAL TESTING	42
TABLE 7 VENDORS OF DRUG IDENTIFICATION KITS	43
TABLE 8 PARTIAL LIST OF SUPPLIERS OF SOLID-STATE FINGERPRINT SCANNERS	48
TABLE 9 LABORATORY ACCREDITATION STATISTICS (% OF LABORATORIES ACCREDITED BY A PROFESSIONAL ORGANIZATION)	53
TABLE 10 CRIME INDEX TOTALS, 1999-2011 (NUMBER/%)	56
TABLE 11 CRIME LABORATORY WORKLOAD STATISTICS, 2005 (CASE REQUESTS)	57
TABLE 12 FORENSIC APPLICATIONS BY INSTRUMENT	59
TABLE 13 KEY CODIS DATABASE STATISTICS, 2000-2010	65
TABLE 14 SIGNIFICANT PRODUCERS OF SPECIALIZED MICROSCOPES USED IN FORENSIC SCIENCES	74
TABLE 15 MOST SUCCESSFUL NIBIN/IBIS PARTNERS	78
TABLE 16 PROJECTED U.S. FORENSIC PRODUCT AND SERVICES MARKET BY SEGMENT, THROUGH 2018 (\$ MILLIONS)	79
TABLE 17 PROJECTED U.S. FORENSIC ANALYTICAL INSTRUMENTS AND SUPPLIES MARKET BY TYPE, THROUGH 2018 (\$ MILLIONS)	81
TABLE 18 PRICES AND NUMBERS OF ANALYTICAL INSTRUMENTS IN FORENSIC LABORATORIES/DEPARTMENTS (\$)	82
TABLE 19 PROJECTED U.S. FORENSIC CHROMATOGRAPHY AND MASS SPECTROMETRY INSTRUMENTS AND SUPPLIES MARKET, THROUGH 2018 (\$ MILLIONS)	82
TABLE 20 PROJECTED U.S. FORENSIC SPECTROPHOTOMETRY INSTRUMENTS MARKET, THROUGH 2018 (\$ MILLIONS/%)	84
TABLE 21 PROJECTED U.S. FORENSIC ELEMENTAL ANALYSIS INSTRUMENTS MARKET, THROUGH 2018 (\$ MILLIONS/%)	84
TABLE 22 PROJECTED U.S. FORENSIC OPTICAL AND SCANNING ELECTRON MICROSCOPE MARKET, THROUGH 2018 (\$ MILLIONS/%)	85
TABLE 23 OPTICAL MICROSCOPE MANUFACTURERS ESTIMATED MARKET SHARE, 2013 (%)	85
TABLE 24 PROJECTED U.S. FORENSIC FLUORESCENT LIGHT SOURCES MARKET, THROUGH 2018 (\$ MILLIONS/%)	86
TABLE 25 MARKET LEADERS SUPPLYING ANALYTICAL INSTRUMENTS	87
TABLE 26 ARRESTS BY DRUG TYPE, 2011 (%)	96
TABLE 27 PROJECTED U.S. FORENSIC DRUG IDENTIFICATION KITS MARKET, THROUGH 2018 (\$ MILLIONS)	98
TABLE 28 ESTIMATED MARKET SHARES OF DRUG KIT COMPANIES, 2010 (%)	99
TABLE 29 PROJECTED U.S. FORENSIC TOXICOLOGY/IMMUNOASSAY MARKET, THROUGH 2018 (\$ MILLIONS)	105

TABLE HEADING	PAGE NO.
TABLE 30 FORENSIC IMMUNOASSAY TESTING PARTICIPANTS, ESTIMATED MARKET SHARE, 2012 (%)	105
TABLE 31 PROJECTED U.S. FORENSIC BIOLOGY AND SEROLOGY TESTING MARKET, THROUGH 2018 (\$ MILLIONS)	109
TABLE 32 FINGERPRINTING APPLICATIONS, PRODUCT TYPES AND SUPPLIERS	115
TABLE 33 COMPLETE LIST OF LIVE SCAN FINGERPRINT SYSTEM MANUFACTURERS	117
TABLE 34 COMPLETE LIST OF CARD SCAN FINGERPRINT SYSTEM MANUFACTURERS	119
TABLE 35 PORTABLE MOBILE ID FINGERPRINT SCAN PRODUCTS AND VENDORS	120
TABLE 36 PROJECTED U.S. FORENSIC FINGERPRINTING MARKET BY PRODUCT TYPE, THROUGH 2018 (\$ MILLIONS)	126
TABLE 37 PRICING COSTS PER UNIT FOR FINGERPRINT SYSTEMS AND SUPPLIES (\$)	127
TABLE 38 ESTIMATED NUMBER OF CRIMINAL FINGERPRINT CARDS SUBMITTED TO THE FBI, THROUGH 2011	129
TABLE 39 STATUS OF EUROPEAN UNION MEMBER STATE DNA DATABASES, DATABASE ENTRY CRITERIA BY COUNTRY, 2013	137
TABLE 40 USE RATES FOR AMPLIFICATION KITS, 2005 (NO./%)	140
TABLE 41 MOST FREQUENTLY USED PCR KITS BY VENDOR	141
TABLE 42 EXAMPLES OF APPLIED BIOSYSTEMS DNA KITS	142
TABLE 43 SEQUENCING ANALYZER PLACEMENTS IN DNA TESTING LABORATORIES, 2002 (RESPONSE FROM 106 FACILITIES)	147
TABLE 44 NDIS APPROVED EXPERT SYSTEMS	149
TABLE 45 CASE WORKLOAD STATISTICS, 1999 AND 2000	154
TABLE 46 FEDERAL FUNDING FOR THE DNA TESTING BACKLOG REDUCTION PROGRAM, 2004-2010 (\$ THOUSANDS)	163
TABLE 47 PROJECTED U.S. FORENSIC DNA TESTING CONVICTED OFFENDER, ARRESTEE AND CASE DATA COMPLETED TESTS, 2007-2016 (MILLIONS)	163
TABLE 48 PROJECTED U.S. FORENSIC DNA TESTING MARKET BY PRODUCT TYPE, THROUGH 2018 (\$ MILLIONS)	163
TABLE 49 FORENSIC DNA RESEARCH AND DEVELOPMENT	169
TABLE 50 RESEARCH AND DEVELOPMENT PRIORITIES IN THE USE OF DNA FOR FORENSIC IDENTIFICATION	202
TABLE 51 PRINCIPAL APPLICATION AREAS FOR UV-IR FORENSIC PHOTOGRAPHY	209
TABLE 52 RCFL PROGRAM HIGHLIGHTS, 2003-2009	215
TABLE 53 EXAMPLES OF NATIONAL SCIENCE FOUNDATION FUNDING FOR COMPUTER FORENSICS RESEARCH (\$)	216
TABLE 54 PDA FORENSIC TOOLS	221
TABLE 55 PERCENT OF CRIME LABORATORIES WITH LIMS BY TYPE OF JURISDICTION, 2002-2009 (%)	237
TABLE 56 ESTIMATED ANNUAL REVENUES FROM RELATED PRODUCTS, 2013 (\$ MILLIONS)	242
TABLE 57 FORENSIC PATENTS BY CLASSIFICATION, 2008-2013	244
TABLE 58 LENGTH OF TIME FROM PATENT FILING TO APPROVAL 2008-MID-2013	245
TABLE 59 RECENTLY ISSUED FORENSIC PATENTS BY INVENTOR/ASSIGNEE, SAMPLE DURING, 2008-MID-2013	245
TABLE 60 COMPANY CONTACT INFORMATION AND PRODUCT FOCUS MATRIX	265
TABLE 61 STATUS OF STATE LAWS ON DNA DATABANKS (CIRCUMSTANCES UNDER WHICH SAMPLES ARE REQUIRED)	271
TABLE 62 ORGANIZATIONS THAT REGULARLY SPONSOR FORENSIC TRADE SHOWS, 2014 CALENDAR	323

LIST OF FIGURES

FIGURE TITLE	PAGE NO.
SUMMARY FIGURE MAJOR U.S. FORENSIC PRODUCTS AND SERVICES MARKET SEGMENTS FORECAST, 2012-2018 (\$ MILLIONS)	9
FIGURE 1 PROJECTED DISTRIBUTION OF U.S. FORENSIC PRODUCT AND SERVICES REVENUES, 2013 VERSUS 2018 (%)	79
FIGURE 2 PROJECTED U.S. FORENSIC ANALYTICAL INSTRUMENTS AND SUPPLIES MARKET BY TYPE, 2012-2018 (\$ MILLIONS)	81
FIGURE 3 PROJECTED U.S. FORENSIC DRUG IDENTIFICATION KITS MARKET 2012-2018 (\$ MILLIONS)	98
FIGURE 4 PROJECTED U.S. FORENSIC TOXICOLOGY/IMMUNOASSAY MARKET, 2012-2018 (\$ MILLIONS)	105
FIGURE 5 PROJECTED U.S. FORENSIC BIOLOGY AND SEROLOGY TESTING MARKET, 2012 TO 2018 (\$ MILLIONS)	110
FIGURE 6 PROJECTED U.S. FORENSIC FINGERPRINTING MARKET BY PRODUCT TYPE, 2012-2018 (\$ MILLIONS)	126
FIGURE 7 GAS CHROMATOGRAPHY SCHEMATIC DIAGRAM	179
FIGURE 8 MASS SPECTROMETER	181
FIGURE 9 HYPHENATED SPECTROSCOPY TECHNIQUES	183
FIGURE 10 UV/VISIBLE SPECTROSCOPE SCHEMATIC DIAGRAM	184
FIGURE 11 PRINCIPAL ELEMENTS OF AN IR SPECTROMETER	185
FIGURE 12 ELEMENTS OF AN FT-IR SPECTROMETER	186
FIGURE 13 THE BASIC ENZYME IMMUNOASSAY (EIA) PROCESS	187
FIGURE 14 PRINCIPAL ELEMENTS OF AN ATOMIC ABSORPTION SPECTROMETER	190
FIGURE 15 THE PCR PROCESS	197