

An Introduction To Forensic Genetics

Since its introduction in the late 1980s, DNA analysis has revolutionized the forensic sciences: it has helped to convict the guilty, exonerate the wrongfully convicted, identify victims of mass atrocities, and reunite families whose members have been separated by war and repressive regimes. Yet, many of the scientific, legal, societal, and ethical concepts that underpin forensic DNA analysis remain poorly understood, and their application often controversial. Told by over twenty experts in genetics, law, and social science, *Silent Witness* relates the history and development of modern DNA forensics and its application in both the courtroom and humanitarian settings. Across three thematic sections, *Silent Witness* tracks the scientific advances in DNA analysis and how these developments have affected criminal and social justice, whether through the arrests of new suspects, as in the case of the Golden State Killer, or through the ability to identify victims of war, terrorism, and human rights abuses, as in the cases of the disappeared in Argentina and the former Yugoslavia and those who perished during the 9/11 attacks. By providing a critical inquiry into modern forensic DNA science, *Silent Witness* underscores the need to balance the benefits of using forensic genetics to solve crime with the democratic right to safeguard against privacy invasion and unwarranted government scrutiny, and raises the question of what it means to be an autonomous individual in a world where the most personal elements of one's identity are now publicly accessible.

The increasingly arcane world of DNA profiling demands that those needing to understand at least some of it must find a source of reliable and understandable information. Combining material from the successful *Wiley Encyclopedia of Forensic Science* with newly commissioned and updated material, the Editors have used their own extensive experience in criminal casework across the world to compile an informative guide that will provide knowledge and thought-provoking articles of interest to anyone involved or interested in the use of DNA in the forensic context. Following extensive introductory chapters covering forensic DNA profiling and forensic genetics, this comprehensive volume presents a substantial breadth of material covering: Fundamental material – including sources of DNA, validation, and accreditation Analysis and interpretation – including, extraction, quantification, amplification and interpretation of electropherograms (epgs) Evaluation – including mixtures, low template, and transfer Applications – databases, paternity and kinship, mitochondrial-DNA, wildlife DNA, single-nucleotide polymorphism, phenotyping and familial searching Court - report writing, discovery, cross examination, and current controversies With contributions from leading experts across the whole gamut of forensic science, this volume is intended to be authoritative but not authoritarian, informative but comprehensible, and comprehensive but concise. It will prove to be a valuable addition, and useful resource, for scientists, lawyers, teachers, criminologists, and judges.

Bridging law, genetics, and statistics, this book is an authoritative history of the long and tortuous process by which DNA science has been integrated into the American legal system. In a history both scientifically sophisticated and comprehensible to the nonspecialist, David Kaye weaves together molecular biology, population genetics, the legal rules of evidence, and theories of statistical reasoning as he describes the struggles between prosecutors and defense counsel over the admissibility of genetic proof of identity. Combining scientific exposition with stories of criminal investigations, scientific and legal hubris, and distortions on all sides, Kaye shows how the adversary system exacerbated divisions among scientists, how lawyers and experts obfuscated some issues and clarified others, how probability and statistics were manipulated and misunderstood, and how the need to convince lay judges influenced the scientific research. Looking to the future, Kaye uses probability theory to clarify legal concepts of relevance and probative value, and describes alternatives to race-based DNA profile frequencies. Essential reading for lawyers, judges, and expert witnesses in DNA cases, *The Double Helix and the Law of Evidence* is an informative and provocative contribution to the interdisciplinary study of law and science.

Forensic science has become increasingly important within contemporary criminal justice, from criminal investigation through to courtroom deliberations, and an increasing number of agencies and individuals are having to engage with its contribution to contemporary justice. This Handbook aims to provide an authoritative map of the landscape of forensic science within the criminal justice system of the UK. It sets out the essential features of the subject, covering the disciplinary, technological, organizational and legislative resources that are brought together to make up contemporary forensic science practice. It is the first full-length publication which reviews forensic science in a wider political, economic, social, technological and legal context, identifying emerging themes on the current status and potential future of forensic science as part of the criminal justice system. With contributions from many of the leading authorities in the field it will be essential reading for both students and practitioners.

Now in its second edition, *Forensic DNA Evidence Interpretation* is the most comprehensive resource for DNA casework available today. Written by leaders in the fields of biology and statistics, including a contribution from Peter Gill, the father of DNA analysis, the book emphasizes the interpretation of test results and provides the necessary formulae in an easily accessible manner. This latest edition is fully updated and includes current and emerging techniques in this fast-moving field. The book begins by reviewing all pertinent biology, and then provides information on every aspect of DNA analysis. This includes modern interpretation methods and contemporary population genetic models available for estimating DNA frequencies or likelihood ratios. Following a chapter on procedures for validating databases, the text presents overviews and performance assessments of both modern sampling uncertainty methods and current paternity testing techniques, including new guidelines on paternity testing in alignment with the International Society for Forensic Genetics. Later chapters discuss the latest methods for mixture analysis, LCN (ultra trace) analysis and non-autosomal (mito, X, and Y) DNA analysis. The text concludes with an overview of procedures for disaster victim identification and information on DNA intelligence databases. Highlights of the second edition include: New information about PCR processes, heterozygote balance and back and forward stuttering New information on the interpretation of low template DNA, drop models and continuous models Additional coverage of lineage marker subpopulation effects, mixtures and combinations with autosomal markers This authoritative book provides a link among the biological, forensic, and interpretative domains of the DNA profiling field. It continues to serve as an invaluable resource that allows forensic scientists, technicians, molecular biologists and attorneys to use forensic DNA evidence to its greatest potential.

Clearly structured throughout, the introduction highlights the different types of crime where these techniques are regularly used. This chapter includes a discussion as to who performs forensic wildlife examinations, the standardisation and validation of methods, and the role of the expert witness in this type of alleged crime. This is followed by a detailed section on the science behind DNA typing including the problems in isolating DNA from trace material and subsequent genetic analysis are also covered. The book then undertakes a comprehensive review of species testing using DNA, including a step-by-step guide to sequence

comparisons. A comparison of the different markers used in species testing highlights the criteria for a genetic marker. A full set of case histories illustrates the use of the different markers used. The book details the use of genetic markers to link two or more hairs/feather/leaves/needles to the same individual organism and the software used in population assignment. The problems and possibilities in isolating markers, along with the construction of allele databases are discussed in this chapter. The book concludes with evaluation and reporting of genetic evidence in wildlife forensic science illustrated by examples of witness statements.

Designed as an accessible introduction to basic scientific principles and their application in professional practice, Forensic Biology provides a concise overview of the field. Focusing solely on the science behind the forensic analysis of biological evidence, this book highlights the principles, methods, and techniques used in forensic serologic and forensic DNA analysis. Divided into two areas, the first addresses the identification of biological fluids including blood, semen, and saliva. Chapters instruct on the identification techniques involved in presumptive and confirmatory tests. The second area covers the individualization of biological evidence using forensic DNA techniques. The book demonstrates extraction methods, quantization methods, DNA profiling analysis, and interpretation of results. Each technique introduced in this text is preceded by a brief background of its development and the basic principles that support the technique and its applications. All methods are discussed in detail and accompanied by schematic illustrations where appropriate. Each chapter presents study questions, and references. Instructors have access to a CD containing PowerPoint lecture slides. Emphasizing the fundamentals of basic science and its application to forensic biology, this book provides a solid scientific grounding and familiarity with not just the principles of biological and biochemical processes that occur in forensic analysis, but also the language and vocabulary of forensic biology. The explanations are accessible and straightforward, and informative to facilitate effective learning.

This text is an accessible, student-friendly introduction to the wide range of mathematical and statistical tools needed by the forensic scientist in the analysis, interpretation and presentation of experimental measurements. From a basis of high school mathematics, the book develops essential quantitative analysis techniques within the context of a broad range of forensic applications. This clearly structured text focuses on developing core mathematical skills together with an understanding of the calculations associated with the analysis of experimental work, including an emphasis on the use of graphs and the evaluation of uncertainties. Through a broad study of probability and statistics, the reader is led ultimately to the use of Bayesian approaches to the evaluation of evidence within the court. In every section, forensic applications such as ballistics trajectories, post-mortem cooling, aspects of forensic pharmacokinetics, the matching of glass evidence, the formation of bloodstains and the interpretation of DNA profiles are discussed and examples of calculations are worked through. In every chapter there are numerous self-assessment problems to aid student learning. Its broad scope and forensically focused coverage make this book an essential text for students embarking on any degree course in forensic science or forensic analysis, as well as an invaluable reference for post-graduate students and forensic professionals. Key features: Offers a unique mix of mathematics and statistics topics, specifically tailored to a forensic science undergraduate degree. All topics illustrated with examples from the forensic science discipline.

Written in an accessible, student-friendly way to engage interest and enhance learning and confidence. Assumes only a basic high-school level prior mathematical knowledge.

This classic in forensic anthropology has been thoroughly updated and greatly expanded for the new Third Edition. The result presents the state of the medicolegal art of investigating human skeletal remains. The third edition follows more than 25 years after the second edition. During this time, considerable changes occurred in the field and Forensic Anthropology became a distinct specialty in its own right. Included in the book are detailed discussions on crime scene investigation, including excavation techniques, time interval since death, human or animal remains, mass graves, and preparation of remains. Existing chapters, all dramatically revised, bring readers in line with the current concepts of skeletal age; determination of sex; assessment of ancestry; calculation of stature; factors of individualization; superimposition and restoration of physiognomy. There is also a section on dental analysis examining such topics as dental anatomy, nomenclature, estimation of age in subadults and adults, determination of sex and ancestry, and pathological conditions. New additions are chapters on skeletal pathology and trauma assessment. A new chapter has also been added on "Forensic Anthropology of the Living." Although all of the sections of the book have been updated significantly, the authors have retained some sense of history to recognize the many pioneers that have shaped the discipline. The text will assist forensic anthropologists and forensic pathologists who have to analyze skeletons found in forensic contexts. This book has a global perspective in order to make it usable to practitioners across the world. Where possible, short case studies have been added to illustrate the diverse aspects of the work.

The use of DNA profiling in forensic cases has been considered the most innovative technique in forensic science since fingerprinting, yet for those with limited scientific knowledge, understanding DNA enough to utilize it properly can be a daunting task. Introduction to Forensic DNA Evidence for Criminal Justice Professionals is designed for nonsc

A state-of-the-art collection of readily reproducible laboratory methods for DNA identity analysis, including Y chromosome haplotyping, mtDNA, and SNP typing. The book offers well-tested protocols for DNA quantification using real-time PCR on forensic samples and for the determination of the number of amelogenine gene copies. For forensic geneticists, there are readily reproducible methods for species identification, ancient DNA, and pharmacogenetics. Additional chapters address new applications in the forensic genetics lab, such a species identification or typing of CYP polymorphisms for the analysis of adverse to drugs.

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An Introduction to Forensic Genetics is a comprehensive introduction to this fast moving area from the collection of evidence at the scene of a crime to the presentation of that evidence in a legal context. The last few years have seen significant advances in the subject and the development and application of genetics has revolutionised forensic science. This book begins with the key concepts needed to fully appreciate the subject and moves on to examine the latest developments in the field, illustrated throughout with references to relevant casework. In addition to the technology involved in generating a DNA profile, the underlying population biology and statistical interpretation are also covered. The evaluation and presentation of DNA evidence in court is

discussed as well with guidance on the evaluation process and how court reports and statements should be presented. An accessible introduction to Forensic Genetics from the collection of evidence to the presentation of that evidence in a legal context Includes case studies to enhance student understanding Includes the latest developments in the field focusing on the technology used today and that which is likely to be used in the future Accessible treatment of population biology and statistics associated with forensic evidence This book offers undergraduate students of Forensic Science an accessible approach to the subject that will have direct relevance to their courses. An Introduction to Forensic Genetics is also an invaluable resource for postgraduates and practising forensic scientists looking for a good introduction to the field.

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This text aims to provide a broad, scientifically rigorous introduction to forensic science. It covers processes from the crime scene to presentation of forensic science in court and focuses on the chemical, biological and physical methods used in forensic examination.

Forensic archaeology is mostly defined as the use of archaeological methods and principles within a legal context. However, such a definition only covers one aspect of forensic archaeology and misses the full potential this discipline has to offer. This volume is unique in that it contains 57 chapters from experienced forensic archaeological practitioners working in different countries, intergovernmental organisations or NGO's. It shows that the practice of forensic archaeology varies worldwide as a result of diverse historical, educational, legal and judicial backgrounds. The chapters in this volume will be an invaluable reference to (forensic) archaeologists, forensic anthropologists, humanitarian and human rights workers, forensic scientists, police officers, professionals working in criminal justice systems and all other individuals who are interested in the potential forensic archaeology has to offer at scenes of crime or places of incident. This volume promotes the development of forensic archaeology worldwide. In addition, it proposes an interpretative framework that is grounded in archaeological theory and methodology, integrating affiliated behavioural and forensic sciences.

Over the past twenty years, there's been a gradual shift in the way forensic scientists approach the evaluation of DNA profiling evidence that is taken to court. Many laboratories are now adopting 'probabilistic genotyping' to interpret complex DNA mixtures. However, current practice is very diverse, where a whole range of technologies are used to interpret DNA profiles and the software approaches advocated are commonly used throughout the world. Forensic Practitioner's Guide to the Interpretation of Complex DNA Profiles places the main concepts of DNA profiling into context and fills a niche that is unoccupied in current literature. The book begins with an introduction to basic forensic genetics, covering a brief historical description of the development and harmonization of STR markers and national DNA databases. The laws of statistics are described, along with the likelihood ratio based on Hardy-Weinberg equilibrium and alternative models considering sub-structuring and relatedness. The historical development of low template mixture analysis, theory and practice, is also described, so the reader has a full understanding of rationale and progression. Evaluation of evidence and statement writing is described in detail, along with common pitfalls and their avoidance. The authors have been at the forefront of the revolution, having made substantial contributions to theory and practice over the past two decades. All methods described are open-source and freely available, supported by sets of test-data and links to web-sites with further information. This book is written primarily for the biologist with little or no statistical training. However, sufficient information will also be provided for the experienced statistician. Consequently, the book appeals to a diverse audience Covers short tandem repeat (STR) analysis, including database searching and massive parallel sequencing (both STRs and SNPs) Encourages dissemination and understanding of probabilistic genotyping by including practical examples of varying complexity Written by authors intimately involved with software development, training at international workshops and reporting cases worldwide using the methods described in this book

If you are studying forensic science, or a related course such as forensic chemistry or biology, then this book will be an indispensable companion throughout your entire degree programme. This 'one-stop' text will guide you through the wide range of practical, analytical and data handling skills that you will need during your studies. It will also give you a solid grounding in the wider transferable skills such as teamwork and study skills.

Wildlife Forensics: Methods and Applications provides an accessible and practical approach to the key areas involved in this developing subject. The book contains case studies throughout the text that take the reader from the field, to the lab analysis to the court room, giving a complete insight into the path of forensic evidence and demonstrating how current techniques can be applied to wildlife forensics. The book contains approaches that wildlife forensic investigators and laboratory technicians can employ in investigations and provides the direction and practical advice required by legal and police professionals seeking to gain the evidence needed to prosecute wildlife crimes. The book will bring together in one text various aspects of wildlife forensics, including statistics, toxicology, pathology, entomology, morphological identification, and DNA analysis. This book will be an invaluable reference and will provide investigators, laboratory technicians and students in forensic Science/conservation biology classes with practical guidance and best methods for criminal investigations applied to wildlife crime. Includes practical techniques that wildlife forensic investigators and laboratory technicians can employ in investigations. Includes case studies to illustrate various key methods and applications. Brings together diverse areas of forensic science and demonstrates their application specifically to the field of wildlife crime. Contains methodology boxes to lead readers through the processes of individual techniques. Takes an applied approach to the subject to appeal to both students of the subject and practitioners in the field. Includes a broad introduction to what is meant by 'wildlife crime', how to approach a crime scene and collect evidence and includes chapters dedicated to the key techniques utilized in wildlife investigations. Includes chapters on wildlife forensic pathology; zooanthropological techniques; biological trace evidence analysis; the importance of bitemark evidence; plant and wildlife forensics; best practices and law enforcement.

Forensic DNA Analysis: Technological Development and Innovative Applications provides a fascinating overview of new and innovative technologies and current applications in forensic genetics. Edited by two forensic experts with many years of forensic crime experience with the Italian police and with prestigious academic universities, the volume takes an interdisciplinary perspective, the volume presents an introduction to genome polymorphisms, discusses, forensic genetic markers, presents a variety of new methods and techniques in forensic genetics, and looks at a selection of new technological innovations and inventions now available from commercial vendors. The book is an important resource for scientists, researchers, and other experts in the field who will find it of interest for its exhaustive discussion of the most important technological innovations in forensic genetics. For those newer to the field, the volume will be an invaluable reference guide to the forensic world.

Forensic science is a subject of wide fascination. What happens at a crime scene? How does DNA profiling work? How can it help solve crimes that happened 20 years ago? In forensic science, a criminal case can often hinge on a piece of evidence such as a hair, a blood trace, half a footprint, or a tyre mark. High profile cases such as the Stephen Lawrence enquiry and the Madeleine McCann case have attracted enormous media attention and enhanced this interest in recent years. However, the public understanding of forensic science is poor, and largely based on TV shows such as CSI: Crime Scene Investigation, which exploit high-tech imagery for dramatic effect. Forensic science is a complex activity at the interface of science and law. However, it also deals with real life issues and its results are interpreted within unique situations. Complex scientific findings must be considered carefully, dispassionately, and communicated with clarity, simplicity, and precision. In this Very Short Introduction, Jim Fraser introduces the concept of forensic science and explains how it is used in the investigation of crime. He begins at the crime scene itself, explaining the principles and processes of crime scene management. He explores how forensic scientists work; from the reconstruction of events to laboratory examinations. He considers the techniques they use, such as fingerprinting, and goes on to highlight the immense impact DNA profiling has had. Providing examples from forensic science cases in the UK, US, and other countries, he considers the techniques and challenges faced around the world. ABOUT THE SERIES: The Very Short Introductions series from Oxford University Press contains hundreds of titles in almost every subject area. These pocket-sized books are the perfect way to get ahead in a new subject quickly. Our expert authors combine facts, analysis, perspective, new ideas, and enthusiasm to make interesting and challenging topics highly readable.

Humanity's most appalling crimes are solved by experts presenting painstakingly gathered evidence to the court of law. Investigators rely on physical, chemical and digital clues gathered at the scene of an incident to reconstruct beyond all reasonable doubt the events that occurred in order to bring criminals to justice. Enter the forensic team, tasked with providing objective recognition and identification and evaluating physical evidence (the clues) to support known or suspected circumstances. Far from the super-sleuths of fiction, the real-life masters of deduction occupy a world of dogged detection, analysing fingerprints or gait, identifying traces of toxins, drugs or explosives, matching digital data, performing anatomical dissection, disease diagnosis, facial reconstruction and environmental profiling.

This issue of the Stanford Law Review contains studies of law, history, and social policy by recognized scholars on such diverse topics as fixing unfair contracts (by Omri Ben-Shahar), using DNA forensics to identify family members in criminal cases and other legal matters (by Natalie Ram), and the ethics of lawyers holding onto real evidence such as guns, tapes, and drugs (by Stephen Gillers). In addition, extensive student work explores the history of religious freedom and the First Amendment, as well as the use of amicus curiae briefs in the Supreme Court after an opinion below is abandoned by a party. The Stanford Law Review was organized in 1948. Each year the Law Review publishes one volume, which appears in six separate issues between December and July. Each issue contains material written by student members of the Law Review, other Stanford law students, and outside contributors, such as law professors, judges, and practicing lawyers. The current volume is 63, for the academic year 2010-2011, and the present compilation, in ebook form, represents Issue 4 for April 2011. In the ebook editions, all footnotes, graphs, and Tables of Contents (including those for individual articles) are fully linked, properly scaled, and functional; the original note numbering is retained; and the issue is properly formatted.

The book explores the fundamental principles, advances in forensic techniques, and its application on forensic DNA analysis. The book is divided into three modules; the first module provides the historical prospect of forensic DNA typing and introduces fundamentals of forensic DNA typing, methodology, and technical advancements, application of STRs, and DNA databases for forensic DNA profile analysis. Module 2 examines the problems and challenges encountered in extracting DNA and generating DNA profiles. It provides information on the methods and the best practices for DNA isolation from forensic biological samples and human remains like ancient DNA, DNA typing of skeletal remains and disaster victim identification, the importance of DNA typing in human trafficking, and various problems associated with capillary electrophoresis. Module 3 emphasizes various technologies that are based on SNPs, STRs namely Y-STR, X-STR, mitochondrial DNA profiling in forensic science. Module 4 explores the application of non-human forensic DNA typing of domestic animals, wildlife forensics, plant DNA fingerprinting, and microbial forensics. The last module discusses new areas and alternative methods in forensic DNA typing, including Next-Generation Sequencing, and its utility in forensic science, oral microbes, and forensic DNA phenotyping. Given its scope, the book is a useful resource in the field of DNA fingerprinting for scientists, forensic experts, and students at the postgraduate level.

Assessing Weight-of-Evidence for DNA Profiles is an excellent introductory text to the use of statistical analysis for assessing DNA evidence. It offers practical guidance to forensic scientists with little dependence on mathematical ability as the book includes background information on statistics – including likelihood ratios – population genetics, and courtroom issues. The author, who is highly experienced in this field, has illustrated the book throughout with his own experiences as well as providing a theoretical underpinning to the subject. It is an ideal choice for forensic scientists and lawyers, as well as statisticians and population geneticists with an interest in forensic science and DNA.

The Innocent and the Criminal Justice System examines competing perspectives on, and definitions of, miscarriages of justice to tackle these questions and more in this critical sociological examination of innocence and wrongful conviction. This book: • is the first book of its kind to cover wrong convictions, from definition and causation to the limits of redress • provides a wealth of case studies and statistics to apply theoretical discussions of the criminal justice system to real-life situations • discusses ideas and challenges that are highly relevant to current political and social debates Elegantly written by a leading expert in the field, this book is essential reading for students of criminology, criminal justice and law, looking to understand the workings of the criminal justice system and how it can fail the innocent.

Fundamentals of Forensic DNA Typing is written with a broad viewpoint. It examines the methods of current forensic

