

# CONTENTS

Dedication .....	v
Acknowledgments .....	vii
About the Author .....	ix
Foreword .....	xi
Preface .....	xiii
<b>Chapter 1 Definitions: Contamination and Interpretation .....</b>	<b>1</b>
1.1 Historical .....	1
1.2 Definition of “Trace-DNA” .....	1
1.3 A Discussion on Contamination .....	4
1.4 Why Do Miscarriages of Justice Occur?.....	11
1.5 Some Fallacies and Errors of Thinking .....	12
1.6 The Likelihood Ratio .....	17
1.7 The Role of the Forensic Scientist .....	19
<b>Chapter 2 A Deep Analysis of the Basic Causes of Interpretation Errors .....</b>	<b>21</b>
2.1 An Exemplar Case: Adam Scott .....	21
2.2 The Miscarriage of Justice in R. v. Jama .....	27
2.3 Characterization of Error .....	30
2.4 Determination of Error Rates.....	36
2.5 Reporting DNA Profiles at Sub-Source Level.....	40
2.6 Reporting DNA Profiles at Source Level .....	41
2.7 Activity Level Reporting .....	46
2.8 The Role of the Prosecution Authorities .....	54
2.9 The Role of the Accreditation/Regulatory Authorities .....	55
2.10 The Database Trawl Problem .....	56
2.11 The Lessons of History .....	58

2.12	The Essentials of Statement Writing .....	59
2.13	Summary .....	64

## **Chapter 3 A Framework to Interpret “Trace-DNA”**

### **Evidence Transfer.....**

3.1	The Statement Structure .....	68
3.2	When and How Did the “Foreign” DNA Transfer to Underneath the Victim’s Fingernails? .....	71
3.3	Base Levels of Foreign DNA Transfer from Experimental Studies .....	73
3.4	Will a DNA Profile That is Transferred by Either “Passive” or Physical Means (Scratching) Persist for 7 Days?.....	74
3.5	Persistence of a DNA Profile Transferred to Fingernails 7 Days Prior to Its Recovery.....	75
3.6	Converting Possibilities into Broad Probabilistic Ranges: A Model for Reporting Officers.....	77
3.7	Summary .....	79

## **Chapter 4 National DNA Databases, Strength of Evidence**

### **and Error Rates .....**

4.1	The Testing Strategy Used by National DNA Databases.....	83
4.2	There are Two Kinds of DNA Databases.....	83
4.3	How the Pitchfork Case Led to the First National DNA Database .....	86
4.4	Defining the “Target Population” .....	87
4.5	Databases are Not Always Needed to Solve Crimes .....	89
4.6	Misconceptions .....	90
4.7	The Strength of Evidence Expressed as a Match Probability .....	91
4.8	Conclusion .....	92
4.9	Searching Entire Databases (Effectiveness Linked to the Adventitious Match) .....	93
4.10	How Does a Search of a NDNAD Affect the Strength of Evidence? .....	94

4.11 Focussing the Investigation (Eliminating More Suspects from the Target Population): Introducing the Concept of “Weights” .....	96
4.12 The Case of R. v. Adams .....	98
4.13 Calculation Using the Weight of Evidence Formulation .....	99
4.14 How Does the Weighting Alter $P(G E_o)$ if the Suspect is Taken from Outside the Target Population? .....	101
4.15 Relevance to Miscarriages of Justice Relating to the Naïve Investigator Effect.....	102
4.16 The Effect of Updating the Evidence Using DNA Profiling (Suspect Chosen from Within the Target Population) .....	102
4.17 The Swamping Effect .....	105
4.18 Is There a Scientific Basis to Define “Weights” Using “Geographic Profiling”? .....	105
4.19 The Effect of a Database Search on the Strength of the Evidence .....	108
4.20 Appeal-Court Rulings on the Use of Bayes Theorem .....	110
4.21 How Far Have the Courts Adopted This Thinking? .....	110
4.22 The Defendant’s Fallacy is Not Necessarily a Fallacy .....	114
4.23 Reconciling the Non-DNA Evidence with the DNA Evidence ....	115
4.24 The False Positive Error (the Elephant in the Room).....	117
4.25 Putting It All Together: A Simple Method for the Investigator to Follow .....	118
4.26 Conclusion .....	120
4.27 The Way Forward?.....	121
4.28 Complex DNA Profiles: The Worrying Case of R. v. Dlugosz— An Example of a Dubious Appeal-Court Decision.....	122
4.29 R. v. Dlugosz .....	122
4.30 Can Expert Opinion Replace Peer Review? .....	122
4.31 A Reminder of the “Scientific Method”.....	124
4.32 False Positive Results .....	125
4.33 Conclusion .....	128

<b>Chapter 5 Concluding Remarks: Illustrated by the Case of the Death of Meridith Kercher.....</b>	<b>131</b>
5.1 The Dynamic Background DNA Environment .....	131
5.2 Laboratory Environmental Monitoring .....	132
5.3 On the Limitations of the Information That Can Be Used to Assess the Relevance of DNA Profiling Evidence .....	134
5.4 Background to the Case “Death of Meredith Kercher” .....	136
5.5 An Outline of the Case Circumstances.....	137
5.6 The Knife (Item 36).....	138
5.7 The “Trace-DNA” Evidence .....	138
5.8 Brief Summary of the Other “Trace-DNA” Profiles on the Knife.....	139
5.9 The Bra-Clasp (Item 165) .....	140
5.10 How Robust is the Answer? .....	141
5.11 Further Evaluation of DNA Profiling Evidence: The Limitations .....	143
5.12 Modes of Transfer: Limitations of the Information That Can Be Used to Assess the Relevance of DNA Profiling Evidence .....	144
5.13 How Was the Evidence Interpreted by the Judges? .....	147
5.14 A Targeted Protocol to Assess the Prosecution Propositions .....	152
5.15 Final Remarks .....	154
 Glossary .....	159
Bibliography .....	167
Index .....	173