EVALUATING THE ROLE AND IMPACT OF FORENSIC DNA PROFILING ON KEY AREAS OF THE CRIMINAL JUSTICE SYSTEM

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Doctor of Philosophy (Science)

2009

CERTIFICATE OF AUTHORSHIP/ORIGINALITY

I certify that the work in this thesis has not previously been submitted for a degree nor has it been submitted as part of requirements for a degree except as fully acknowledged within the text.

I also certify that the thesis has been written by me. Any help that I have received in my research work and the preparation of the thesis itself has been acknowledged. In addition, I certify that all information sources and literature used are indicated in the thesis.

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Acknowledgements

I would like to thank the following people who despite the pressures of their professional lives gave time, advice, practical or financial assistance to this project. In Australia I would like to thank Dr James Robertson and Mr Paul Reedy of the Australian Federal Police; Assistant Commissioner Carlene York and Chief Superintendent Phil Flogel of the Forensic Services Group, NSW Police Force; Dr Ross Vining of Forensic Science South Australia (formerly of ICPMR-DAL), Mr Robert Goetz and Mr Stuart Davis of the ICPMR-DAL Forensic Biology Laboratory; Dr Jane Hemmings of the Australian Federal Police for her expert formatting assistance; Dr Sarah Benson and Ms Jo Lee of the Australian Federal Police for their support during pressure times; Mr Michael Strutt, Forensic Consultant for his useful information and discussions; Mr Wayne Tosh, Mr David Raper and all the staff of the Forensic Procedures Implementation Team (FPIT) NSW Police Force; Ms Fiona Said and Ms Kate Robinson for their research assistance toward Part II; Dr Michael Briody of Griffith University; and Mr Andrew Haesler SC of the NSW Public Defenders Office.

Internationally I have received similar advice and assistance from many people including (but not limited to) Dr Susan Hitchin of the INTERPOL DNA Unit; Professor Pierre Margot and staff of Ecole Sciences Criminelle in Lausanne; Dr Alexandre Girod and staff of the Police Canton Vaudoise Police; Professor Walter Bär and staff of the Zürich Institute of Legal Medicine; Colonel Jacques Hebrard and Commandant Yvan Malgorn of the Institut de Recherche Criminelle de la Gendarmerie Nationale; Dr Kwong Yuk To of the Hong Kong Government Forensic Laboratory for advice regarding the HK DNA Database; Mr Song Chen of the Ministry of Public Security and Dr Ya Jun Deng of the Centre for Forensic Sciences, Beijing Genomics Institute for advice regarding Chinese DNA database; Mrs W F Tan, of the Singapore Police for advice regarding the Singapore DNA database; Ms Deryi Mu of Applied Biosystems for advice regarding DNA Database progress in Asia; Dr Anil K Sharma; Superintendent Alyeth Rasheef of the Israel National

Police; Dr Nikita Khromov-Borisov of the Forensic Medicine Bureau of Leningrad District; My great friend Ms Gillian Crowe formerly of ESR Ltd. for research assistance on legal issues; Dr James Curran of University of Auckland for high quality outcomes to assist modeling and simulation experiments; Ms Jo Bright for advice and information regarding NZ DNA database operations; Judge Arthur Tompkins Judge of the District Court of New Zealand for invaluable legal insight; Chris Asplen of Gordon Thomas Honeywell for advice and assistance freely and generously given; Mr Richard Pinchin of the UK FSS for information and advice given, as always, in good humour; Mr Bob Greene OBE of the National Police Improvement Agency for inspiring ideas and collaboration; Drs Bruce Budowle and Tom Callaghan of the Federal Bureau of Investigation for information regarding CODIS; Dr John M. Butler of the National Institute of Standards and Technology for insightful discussions and encouragement; Drs Ron Fourney and Sylvain Lalonde of the Royal Canadian Mounted Police.

Of all the academic assistance I have received I acknowledge above all that provided by my supervisors Professor Claude Roux, Dr John Buckleton, Professor Olivier Ribaux and Dr Tony Raymond. I feel privileged to have benefited from the guidance and support of these esteemed leaders of the forensic field and their contribution to my development and that of this research has been significant.

For support of an entirely different nature but most comprehensive still, I give my heartfelt thanks to my network of family and friends, in particular Matt and Mel, Dan and Simone and Mum and Dad. I feel your belief in me and the power of this was crucial in getting me through.

To Heidi, this work is as much yours as it is mine. Getting to this point is something that we can be proud of and something that quite simply would not have been achieved without your unwavering love, support, trust and encouragement. Our family life with Jake will be a new experience from this day forward – bring it on!

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List of Abbreviations

ABS	Australian Bureau of Statistics
ACT	Australian Capital Territory
AF	Alleged father
AFLP	Amplified fragment length polymorphism
AIMS	Ancestry informative markers
ALRC	Australian Law Reform Commission
AMOS	Automated Modus Operandi System
APMC	Australasian Police Ministers' Council
ARMS	Amplification refractory mutation system
ASIP	Agouti Signalling Protein
Aus	Australia
bp	Base-pairs
C	Number of crime profiles on a DNA Database
CCA	Court of Criminal Appeal
CJS	Criminal Justice System
CODIS	Combined DNA Index System
Cth	Commonwealth
DAB	DNA Advisory Board (USA)
DAL	Division of Analytical Laboratories (NSW, Aus)
DB	Database
DNA	Deoxyribonucleic acid
EDNAP	European DNA Profiling Group
EMPOP	European Mitochondrial DNA Population Database
ENFSI	European Network of Forensic Science Institutes
ESR	Institute of Environmental Science and Research Ltd. (NZ)
EU	European Union
FBI	Federal Bureau of Investigation
FSS	Forensic Science Service (UK)
H	Number of crime-to-person links arising from a DNA Database
HLA	Human Leukocyte Antigen
HR	Hit Rate
HV2	Hypervariable region 2
HVI	Hypervariable region 1
HWE	Hardy-Weinberg equilibrium
IAELIA	International Association of Law Enforcement Intelligence Analysts
IAM	Infinite alleles model
LCN	Low copy number
LDIS	Local DNA Index System (USA)
LE	Linkage equilibrium
LEIU	Law enforcement intelligence unit
LR	Likelihood ratio
MC1R	Melanocortin 1 Receptor Gene
MCCOC	Model Criminal Code Officers Committee

MCF	Major Crime File
McSNP	Melting curve SNP typing
mtDNA	Mitochondrial DNA
MW	Molecular weight
N	Number of person profiles on a DNA Database
NATO	North Atlantic Treaty Organization
NCIDD	National Criminal Investigation DNA Database
NDDB	National DNA Database (Canada)
NDNAD	National DNA Database (UK)
NFI	Netherlands Forensic Institute
NIFS	National Institute of Forensic Science (Aus)
NRC	National Research Council
NRY	Non-recombining portion of the human Y-chromosome
NSW	New South Wales
NT	Northern Territory
NZ	New Zealand
PACE	Police and Criminal Evidence Act 1984 (UK)
PAGE	Polyacrylamide gel electrophoresis
PCA	Principal components analysis
PCR	Polymerase chain reaction
Qld	Queensland
RCMP	Royal Canadian Mounted Police
RFLP	Restriction fragment length polymorhism
RI	Return Index
RMP	Random match probability
SA	South Australia
SBE	Single base extension
SC	Supreme Court
SCAG	Standing Committee of Attorneys-General
SDIS	State DNA Index System (USA)
SEA	South East Asian
SNP	Single nucleotide polymorphism
SOCOs	Scene of Crime Officers
SSM	Slipped strand mis-pairing
SSO	Sequence specific oligonucleotide
STR	Short tandem repeat
Tas	Tasmania
TWGDAM	Technical Working Group on DNA Analysis Methods
UAE	United Arab Emirates
UK	United Kingdom
UN	United Nations
USA	United States of America
Vic	Victoria
VNTR	Variable number tandem repeat
WA	Western Australia
YHRD	Y-chromosome haplotype reference database
Y-STR	STR loci on the human Y-chromosome

Abstract

The advent of the modern technique of forensic DNA profiling has resulted in a lively union between one of the more advanced and dynamic disciplines of modern science and what is, arguably, society's most revered, influential and complex institution, the criminal justice system (CJS). The alliance, begun over 20 years ago, has been fruitful in obvious ways. There has been profound technological advancement, and astonishing policing outcomes. But the years have also brought strains, evidenced in the on-going, and sometimes bitter, socio-legal controversy.

The sheer pace of the developments surrounding DNA profiling, and the scope of its impact, have meant that the forensic and legal agencies associated with its use have often been able to do little more than fight a rearguard action when it came to handling the pressures and complexities they faced. This has been particularly the case since the use of forensic DNA databases began expanding so notably around the globe.

Managing the demand for the forensic technology, and its remarkable potential, has required an unprecedented commitment of public funds. Both forensic and police operational practices have had to be modified. And very close attention has been called for on the part of judicial and legislative bodies in states and countries everywhere. Given the circumstances in which this substantial progress has occurred, the capacity of the forensic community to undertake reasoned strategic assessment of the future implications of change has been severely restricted. In fact, there has been a lack of reflection, and far too little evaluation of the outcomes of developmental efforts and achievements. The focus of the forensic community has been consumed with meeting the immediate demands and implementing the next generation of technology.

No matter how understandable it might be, this situation is unfortunate. Over recent years the field of forensic DNA profiling has matured from being an obscure, niche

discipline to become a mainstream, public-good science. The technological platform for it and its operational scope have both broadened notably; and the socio-legal ramifications of its use have intensified.

This vast increase in the scale and complexity of the operational context of the forensic DNA discipline makes it imperative that the forensic community understand its role in a more holistic sense so as to have a greater level of influence over its future impact. Achieving this requires developing a deeper awareness of the contextual environment within which forensic DNA profiling is applied. This research sets out to undertake such an evaluation. Its aim is to take a system-wide view of the role and impact of forensic DNA profiling on key areas of the CJS.