The Communication of Science Through Crime Fiction

Vanda Symon

A thesis submitted for the degree of Doctor of Philosophy at the University of Otago, Dunedin, New Zealand

June 2017
Dedicated to the memory of

Jules Kieser

1950 - 2014
Abstract

**Background:** Science can be communicated informally through fictional media. Crime fiction in print media has contained elements of forensic science since the first detective stories, for example, Sherlock Holmes. Modern day crime fiction includes visual media, such as the television series *CSI: Crime Scene Investigation*, as well as print media. All influence and potentially educate readers of the genre.

**Aim:** The aim of the research reported in this thesis was to explore reader expectations and author approaches to science communication through crime fiction, and therefore if forensic science could be communicated through print crime fiction. It did this in three ways. The communication of science through the crime fiction of Ngaio Marsh was analysed first. Then the attitudes of writers of crime fiction towards the science that they included in their novels was investigated. Thirdly, the attitude of readers to the science they encountered while reading crime fiction was surveyed.

**Methods:** Part one: The body of work, research methods and factors that influenced New Zealand crime writer Ngaio Marsh were examined as a case study. This gave a historic perspective to the question can science be communicated through crime fiction, and informed the questions for the subsequent contemporary writer and reader surveys.

Part two: Writers of crime fiction were surveyed using an online anonymous online survey to examine their attitudes towards the science they include in their novels. There were 43 responses to this survey.

Part three: Readers of crime fiction were surveyed using an anonymous online survey to examine their attitudes towards the forensic science they encountered whilst reading crime novels. There were 1024 responses to this survey.
**Results:** The case study of Ngaio Marsh demonstrated the author ensured the accuracy of the science included in her novels. It also indicated she understood the potential flow-on effects of her writing, such as educating criminals and inspiring copycat crime.

The author survey indicated most of the authors who included science in their crime fiction researched it thoroughly and ensured that it was accurate in the context of the story. Many reported an ethical obligation to provide accurate information to their readers, but were aware of potential flow-on effects.

The reader survey demonstrated that readers expected the science they encountered in crime fiction to be true and accurate, and believed that the writers of crime fiction took care to ensure it was factually correct. Many liked to learn some forensic science (80%), and enjoyed learning about forensic science through reading crime fiction.

**Conclusion:** The combined results of the case study, author survey and reader survey indicated that forensic science can be communicated through crime fiction. This is contingent upon the scientific information being true, accurate, and relevant in the context of the story. The writers of crime fiction felt a responsibility to provide accurate scientific information although some were wary of the potential for that information to be used in the perpetration of a crime. Writers ensured the science they included in their fiction was correct, but were concerned a reader would point out a factual error in their work. Readers enjoyed learning about forensic science but it had to fit within the context of the story. Readers indicated it was important that the forensic science in crime fiction was true and accurate, and believed most writers took care to ensure it was. The readers’ expectation of accuracy and the authors’ sense of obligation to deliver accurate forensic science in their fiction aligned, demonstrating that science could be communicated through crime fiction.
Preface

The thesis title *The Communication of Science through Crime Fiction* encapsulates the important features of my professional life. When exploring potential choices for a research topic I wanted to find a subject matter that was relevant to my life as a crime writer, pharmacist and communicator. The subject allowed me to examine the communication of science from a previously unexplored angle to add to the body of knowledge in the field.

I am a writer of crime fiction, and have had five novels published by Penguin New Zealand. Some have also been translated into German. I write a detective series, and psychological thrillers. As a New Zealander, I admired the crime writing achievements of fellow New Zealander Dame Ngaio Marsh. Over her writing career Marsh wrote 32 Detective Chief Inspector Roderick Alleyn novels. She was internationally renowned and her name held up alongside the great British writers Agatha Christie, Marjorie Allingham and Dorothy Sayers. Her works had been studied from a literary and social perspective, but not from the angle of science communication. Marsh was the ideal candidate for a case study on how an author communicated science, how she researched, what weight she placed on accuracy, and what was her awareness or attitude toward the potential flow on effects on her readers. Her novels were written over a span of fifty years, which also provided a tidy time frame for observing if she included new and updated forensic technology in her works.

One of the observations I had made while reading Marsh’s works was that she was very self-aware of the effects of her fiction on the reader. This led me to ask two questions: do readers believe the science they read in crime fiction; and are writers concerned that the scientific information they include is accurate? The evidence I found in Marsh’s works indicated that she cared about accuracy, but what of the modern-day writer? Expanding this line of questioning resulted in the development of the two surveys incorporated into this thesis – a survey of the writers of crime fiction, and a survey of the readers of crime fiction. The case study of Ngaio Marsh
contextualised and informed both the writers’ survey and the readers’ survey.

By examining the beliefs and expectations of readers, and the attitudes and obligations of writers, the surveys and case study created a platform to enable discussion of the communication of science through popular media and in particular, the medium of crime fiction.
Acknowledgements

This research would not have been possible without the support of my supervisor team. I am indebted to the late Jules Kieser for fueling the fire, encouraging me to undertake a PhD and gathering an amazing group of people to support it. To Jean Fleming and the Centre for Science Communication for setting me on the path as my primary supervisor until her retirement, and to Natalie Medlicott for taking up the mantle of primary supervisor and finding me a home in the School of Pharmacy. Thank you to Sue Heydon for her constancy and for anchoring the historic elements of this thesis. Thanks to Nicola Peart for her enthusiasm as my PhD committee chair and for being a strength when we had difficult times. I am very grateful to Warwick Duncan for stepping into the team after the untimely death of Jules.

Thank you to Andrew Grey for his assistance with the statistical analysis involved in this research. To Emma Heydon for tutoring me in the use of the STATA software, and to Ailsa McGregor and James Green for assistance with the correlations.

The Ngaio Marsh Trust were very supportive in giving access to Ngaio Marsh House and her research materials. Thank you to Bruce Harding for his advice on Ngaio Marsh and individuals who knew her and to Ngaio Marsh biographer Jo Drayton for her pointers at the beginning of this project. Thanks to Helen Leach for the snippets on Ngaio Marsh that she regularly channeled my way, and to Bill Carter for his information about shearing in New Zealand. Thanks to my readers, Glynny Kieser and Lea Doughty.

I am hugely grateful to the University of Otago for their financial support with awarding me a University of Otago Doctoral Scholarship, and to the School of Pharmacy for their support with a departmental award.

This PhD would not have been possible without the support of my family, Glenn, Riley and Corey, who have come on this journey with me, and my Mum. Thank you for your patience and understanding!
Publications and presentations

Publications


Publications under review:


Conference Presentations

The Sixth International Conference on Science in Society, Vancouver, 2014. Paper presentation:

Before CSI: Making the Case for a Novel Portrayal of Forensic Science.

Pacific Voices XII, Pacific Postgraduate Symposium, Dunedin 2015. Paper presentation:

Before CSI: Making the Case for a Novel Portrayal of Forensic Science.

Pacific Voices XIII, Pacific Postgraduate Symposium, Dunedin 2016. Research presentation:

Science in Crime Fiction: Accuracy and the Reader Experience.

Pacific Voices XIV, Pacific Postgraduate Symposium, Dunedin 2017. Research presentation:

Finding your respondents – Snowball sampling in online survey based research: advantages, limitations and practical observations.
# Table of Contents

Abstract ......................................................................................................................... iii
Preface .......................................................................................................................... v
Acknowledgements ....................................................................................................... vii
Publications and presentations ................................................................................... viii
Publications .................................................................................................................. viii
Conference Presentations ............................................................................................ viii

Table of Contents ......................................................................................................... ix

List of Tables .................................................................................................................. xiii

List of Figures ................................................................................................................ xiv

Hypotheses ..................................................................................................................... 1
Aim .................................................................................................................................. 1
Thesis Structure ............................................................................................................. 1

## 1 Chapter One: Introduction and Literature Review ............................................ 4
1.1 Literature review ................................................................................................. 9
1.2 Forensic science ................................................................................................. 9
1.3 The CSI Effect .................................................................................................... 11
1.4 Learning facts from fiction: The effective communication of knowledge .... 19
1.5 Ethical considerations in communicating science through crime fiction ... 25
1.6 The Communication of Science ....................................................................... 26
1.7 Conclusion .......................................................................................................... 34

## 2 Chapter Two: Methods ......................................................................................... 36
2.1 Mixed methods research theory ......................................................................... 36
2.1.1 Case study methodology ............................................................................. 40
2.1.2 Survey methodology .................................................................................. 43
2.1.3 Likert-type scales and collapsed data ....................................................... 44
2.1.4 Non-random sampling method ................................................................. 45
2.1.5 Virtual snowball sampling ......................................................................... 46
2.2 Case study of Ngaio Marsh ............................................................................. 48
2.2.1 Case Study Propositions ........................................................................... 48
2.2.2 The logic that linked the data collected to the study propositions, and the criteria for interpreting the findings ......................................................... 48
2.2.3 Review of the bibliography, primary and secondary materials of Ngaio Marsh ................................................................................................................ 49
2.2.4 Interviews with individuals who knew Ngaio Marsh ................................ 51
2.3 Survey Methodology ......................................................................................... 53
2.3.1 Survey development .................................................................................. 53
2.3.2 Pilot studies in the survey development process ........................................ 53
2.3.3 Open text boxes for participant comments .............................................. 55
2.3.4 Author survey sampling frame ................................................................. 55
2.3.5 Reader survey sampling frame ................................................................. 56
2.3.6 Participant recruitment for writers’ and readers’ surveys ......................... 57
2.3.7 Data collection and analysis ...................................................................... 58
2.3.8 Missing data protocol ............................................................................... 59
2.4 Ethical approval for interviews of individuals who knew Ngaio Marsh ... 60
3 Chapter Three: Results of the case study: Ngaio Marsh, New Zealand
Crime Fiction novelist (1895–1982) ................................................................. 61
3.1 The Study Questions ...................................................................................... 61
3.2 Biography of Ngaio Marsh ........................................................................... 62
3.3 Examination of the study propositions ......................................................... 67
  3.3.1 Ngaio Marsh viewed the science in her novels and its accuracy as being important ................................................................. 67
  3.3.2 Ngaio Marsh undertook thorough research for her novels ................... 71
  3.3.3 Ngaio Marsh was aware of the potential flow-on effects of providing forensic science in her novels ................................................................. 75
3.4 The forensic science used in the novels of Ngaio Marsh .......................... 82
3.5 Conclusion .................................................................................................... 83

4 Chapter Four: Results of the Author Survey – Writing science into crime fiction: author attitudes to forensic science in their work ......................... 85
4.1 Survey response rate and calculation of sample size ............................... 85
4.2 Participant demographics ............................................................................ 87
4.3 Author responses to survey questions and statements ............................ 89
  4.3.1 What genre or genres of crime fiction do you write? ......................... 90
  4.3.2 Do you include the use of forensic science in your novels? ............. 91
  4.3.3 Readers expect crime fiction novels to contain forensic science ......... 92
  4.3.4 Readers take crime fiction that contains forensic science more seriously 93
  4.3.5 The advent of forensic TV programmes such as CSI has increased the pressure on writers to include forensic science in their novels ................. 94
  4.3.6 Readers believe the forensic science they read in crime fiction is true and accurate ............................................................................................................................... 96
  4.3.7 Readers believe the accuracy of science written in a novel more than the accuracy of science they see in a TV programme such as CSI .................. 97
  4.3.8 I like to thoroughly research the forensic science I use in my novels.... 98
  4.3.9 I always ensure the science I include in my fiction is correct ............. 99
  4.3.10 I am happy to have slightly incorrect scientific information if it advances the story ................................................................................................. 100
  4.3.11 I feel an ethical obligation to ensure the forensic science included in my novels is correct ................................................................................................. 101
  4.3.12 I worry that a reader will point out a factual error in my work .......... 102
  4.3.13 I am concerned about the potential for copycat crime as a result of my fiction writing ................................................................................................. 103
  4.3.14 I have purposefully withheld scientific information in my novels due to my concern for potential copycat crime occurring .................................. 104
  4.3.15 My work has had copycat crime occur where the perpetrators used methods or inspiration from my writing ......................................................... 104
  4.3.16 I am concerned that perpetrators will learn how to avoid leaving behind evidence as a result of reading my fiction ............................................. 105
  4.3.17 I have purposefully withheld scientific information in my novels due to my concern for perpetrators learning how to avoid leaving behind forensic evidence 106
4.4 Correlation analysis ...................................................................................... 107

5 Chapter Five: Results of the reader survey - Do you believe the science you read in crime fiction? ................................................................. 112
5.1 Survey response rate .............................................................. 112
5.2 Participant demographics ...................................................... 113
  5.2.1 Gender of participants of the reader survey ......................... 113
5.3 Reader responses to survey questions and statements .............. 116
  5.3.1 I like to read crime fiction that includes the use of forensic science .... 117
  5.3.2 I find crime fiction novels that contain forensic science are more believable ................................................................. 118
  5.3.3 I read crime fiction purely for entertainment .......................... 119
  5.3.4 When I read crime fiction I am interested in the forensic science as well as the story ...................................................... 120
  5.3.5 I like to learn some interesting forensic science when I read crime fiction 121
  5.3.6 I expect to learn some interesting forensic science when I read crime fiction 122
  5.3.7 It is important to me that the forensic science in crime fiction novels is true and accurate ..................................................... 123
  5.3.8 I believe the forensic science in crime fiction is true and accurate .... 124
  5.3.9 I believe most writers take care to ensure the forensic science they use in crime fiction is true and accurate .............................. 125
  5.3.10 Please name some crime writers you feel you can trust to provide true and accurate forensic science in their crime fiction novels 126
  5.3.11 Please name some crime writers you do NOT trust to provide true and accurate forensic science in their novels ........................ 127
  5.3.12 If I find errors in the forensic science used in a novel, it affects my belief in all aspects of the novel ............................................. 129
  5.3.13 Watching forensic TV programmes such as CSI has increased my expectation on writers to include forensic science in their novels 130
  5.3.14 I believe the accuracy of science written in a novel more than the accuracy of the science I see in a TV programme such as CSI ............ 131
  Do you have any further comments? .......................................... 132
5.4 Correlation analysis between reader survey statements .......... 135
5.5 Snowball sampling and effects of time on participant responses .... 137
  5.5.1 Division of the reader survey into time-based tertiles .................. 138
  5.5.2 Correlation analysis of time-based tertiles and reader survey responses 140
  5.5.3 Correlation analysis of time-based tertiles and reader survey demographic information ...................................................... 142
6 Chapter Six: Discussion ............................................................. 144
6.1 Discussion of the case study of Ngaio Marsh ......................... 144
  6.1.1 Methods of the case study of Ngaio Marsh .......................... 146
6.2 Discussion of the results of the author survey ......................... 146
  6.2.1 Accuracy of the science included in crime fiction .................. 147
  6.2.2 The flow-on effects of providing scientific information in fiction .... 150
  6.2.3 Demographic information of authors .................................. 152
6.3 Discussion of the results of the reader survey ....................... 154
  6.3.1 Readers’ responses to survey statements ............................ 154
  6.3.2 Reader survey methods .................................................. 158
  6.3.3 Sources of bias .......................................................... 160
6.4 General discussion ............................................................. 161
  6.4.1 Limitations of the research ............................................. 169
  6.4.2 Future research .......................................................... 170
6.4.3 Conclusions

References

Appendices

Appendix 1: Selected Bibliography of Ngaio Marsh {Harding, 2016 #259} .......... 185
  Novels .................................................................................................................. 185
  Short Fiction: ...................................................................................................... 186
  Non-fiction books and monographs ................................................................. 187
  Articles and essays............................................................................................ 188
  Broadcasts ......................................................................................................... 189
  Plays ..................................................................................................................... 190
  Television script ............................................................................................... 190

Appendix 2: Summary of forensic science used in the novels of Ngaio Marsh ... 191
Appendix 3: Secondary Materials ..................................................................... 200
Appendix 4: Guide for interviews of individuals who knew Ngaio Marsh ....... 203
Appendix 5: Reader Survey for distribution ...................................................... 204
Appendix 6: Author survey for distribution ....................................................... 213
Appendix 7: URLs for author survey initial snowball sampling seeding .......... 224
Appendix 8: URLs for reader survey initial snowball sampling seeding .......... 225
Appendix 9: Author survey nVivo themes ......................................................... 226
Appendix 10: Reader survey nVivo themes ........................................................ 227
Appendix 11: Correlations between reader survey statements ....................... 228
Appendix 12: Reader Survey Country of Residence .......................................... 231
Appendix 13: Correlations between time-based tertiles and reader survey statements ......................................................... 232
List of Tables

Table 1: The Many Effects of CSI: Typology of CSI Effects Found in Media Accounts (Cole and Dioso-Villa 2009, p1345)........................................................................................................13
Table 2: Author survey questions Spearman’s correlation statistics ...........................................................................108
Table 3: Significant correlations between the Author Survey questions (p<0.05)..........................................................109
Table 4: Top ten most trusted authors (% of 1590 total occurrences) ...........................................................................126
Table 5: Top ten non-trusted authors. (% of 183 total occurrences) .................................................................................128
Table 6: Reader survey questions correlation statistics (p<0.05) .................................................................................136
Table 7: Spearman correlation coefficients for time-based tertiles and reader survey responses (p<0.05) .........................................................................................................................141
Table 8: What is your gender (p = 0.072). .........................................................................................................................142
Table 9: What is your age in years? (p = 0.271). ..................................................................................................................142
Table 10: What is your highest educational qualification? (p = 0.036). ..............................................................................143
List of Figures

Figure 2: Age of author survey respondents (n = 37) ........................................ 87
Figure 3: Highest educational qualification of author survey respondents (n = 37) ........ 88
Figure 4: Country of residence of author survey respondents (n = 38) ...................... 88
Figure 5: Question 2: What genre or genres of crime fiction do you write? (n = 41) ........ 90
Figure 6: Question 3: Do you include the use of forensic science in your crime novels? (n = 41) .......................................................... 91
Figure 7: Question 4: Readers expect crime fiction novels to contain forensic science (n = 36). ............................................................................ 92
Figure 8: Question 5: Readers take crime fiction that contains forensic science more seriously (n = 37). ......................................................... 93
Figure 9: Question 6: The advent of forensic TV programmes such as CSI has increased the pressure on writers to include forensic science in their novels (n = 37). ................ 94
Figure 10: Question 7: Readers believe the forensic science they read in crime fiction is true and accurate (n = 37). ............................................................. 96
Figure 11: Question 8: Readers believe the accuracy of science written in a novel more than the accuracy of science they see in a TV programme such as CSI (n = 37) ....... 97
Figure 12: Question 9: I like to thoroughly research the forensic science I use in my novels (n = 37). .................................................................................. 98
Figure 13: Question 10: I always ensure the science I include in my fiction is correct (n = 37). 99
Figure 14: Question 11: I am happy to have slightly incorrect scientific information if it advances the story (n = 37). ................................................................. 100
Figure 15: Question 12: I feel an ethical obligation to ensure the forensic science included in my novels is correct (n = 37). ........................................ 101
Figure 16: Question 13: I worry that a reader will point out a factual error in my work (n = 37). ................................................................. 102
Figure 17: Question 15: I am concerned about the potential for copycat crime as a result of my fiction writing (n = 37). ......................................................... 103
Figure 18: Question 16: I have purposefully withheld scientific information in my novels due to my concern for potential copycat crime occurring (n = 37) .................. 104
Figure 19: Question 18: I am concerned that perpetrators will learn how to avoid leaving behind evidence as a result of reading my crime fiction (n = 36) ......................... 105
Figure 20: Question 19: I have purposefully withheld scientific information in my novels due to my concern for perpetrators learning how to avoid leaving behind forensic evidence (n = 37). ........................................................ 106
Figure 21: Reader survey respondent age (n = 832). ................................................. 114
Figure 22: Reader survey respondent level of education (n = 819). ......................... 114
Figure 23: Reader survey respondent geographical region of residence (n = 798) .......... 115
Figure 24: Question 2: I like to read crime fiction that includes the use of forensic science (n = 963). ................................................................. 117
Figure 25: Question 3: I find crime fiction novels that contain forensic science are more believable (n = 965). ......................................................... 118
Figure 26: Question 4: I read crime fiction purely for enjoyment (n = 963) ................. 119
Figure 27: Question 5: When I read crime fiction I am interested in the forensic science as well as the story (n = 963). ......................................................... 120
Figure 28: Question 6: I like to learn some interesting forensic science when I read crime fiction (n = 960). ................................................................. 121
Figure 29: Question 7: I expect to learn some interesting forensic science when I read crime fiction (n = 960). ................................................................. 122
Figure 30: Question 8: It is important to me that the forensic science in crime fiction novels is true and accurate (n = 856). ......................................................... 123
Figure 31: Question 9: I believe the forensic science in crime fiction is true and accurate (n = 853). .................................................................
Figure 32: Question 10: I believe most writers take care to ensure the forensic science they use in crime fiction is true and accurate ($n = 851$). .......................................................... 125
Figure 33: Question 13: If I find errors in the forensic science used in a novel, it affects my belief in all aspects of the novel ($n = 844$). .......................................................... 129
Figure 34: Question 14: Watching forensic TV programmes such as CSI has increased my expectation on writers to include forensic science in their novels ($n = 828$). ................. 130
Figure 35: Question 15: I believe the accuracy of science written in a novel more than the accuracy of the science I see in a TV programme such as CSI ($n = 843$). .......................... 131
Figure 36: Responses received for reader survey over time ($n = 1009$). ........................................ 137
Figure 37: Region of residence divided into tertiles ................................................................. 139
Figure 38: Age of participants divided into tertiles ................................................................. 139
Hypotheses

It is important to readers of crime fiction that the science they encounter in novels is accurate. Writers of crime fiction endeavor to ensure the science they include in their fiction is accurate.

Aim

The aim of the research reported in this thesis is to explore reader expectations and author approaches to science communication through crime fiction. It asks the research questions 1) Do readers of crime fiction place value on scientific accuracy? And 2) What attitudes do writers of crime fiction have about the accuracy of science in their fiction? It does this in three ways, all of which contribute to the exploration of the research question firmly within crime fiction, and how science can be communicated through the medium. First, it undertakes a case study looking at the communication of science through the crime fiction of Ngaio Marsh. This aims to give a historic perspective of communication in science, and to inform the subsequent contemporary surveys. It then examines the attitudes of writers of crime fiction towards the science they include in their novels. The aim of the author survey is to establish the importance of accuracy for writers, and if they are concerned about potential flow-on effects of providing accurate scientific information. Finally, it looks at the attitudes and reactions of readers to the science they encounter while reading crime fiction. The aim of the reader survey is to establish if readers believe the science they read in crime fiction, and if the accuracy of that science is important to them. These three strands and their inter-relationships are then discussed to examine what they say about the communication of science in crime fiction.
Thesis Structure

This thesis is multi-approach and cross-disciplinary, and as such, the structure has been developed to best communicate the exploration and discussion of the thesis research question.

Chapter one provides an introduction and reviews the literature. The areas explored are forensic science, The CSI Effect, the incidental acquisition of knowledge, and the communication of science. This locates the thesis within several distinct subjects that are linked by the research question and the three strands of the method. It shows the relationship between these strands and cements them in the existing literature.

Chapter two describes the methods used in the course of this study and the theory behind them. There were three distinct methods, which were used to critically assess the thesis question.

The first part was a case study of New Zealand crime writer Dame Ngaio Marsh. The case study examined her research methods, and her attitudes towards providing accurate science in her crime fiction novels and the potential flow-on effects of providing that science to readers. This historic examination of an individual author’s approach to science communication through their crime fiction contextualised and informed the survey elements of the research.

To bring a current-day element to this research, writers of crime fiction were surveyed to examine their attitudes towards the science they included. This made up the second thread of the research. Questions included in the survey covered the accuracy of the information they included in their work, whether they were ethically bound to provide accurate information, and also whether writers were concerned about the possibility of copycat crime or the educating of criminals as a result of their works.

The third part of the method was the reader survey. This survey examined whether readers of crime fiction believed the science they read in crime
fiction, and whether the science and the accuracy of the science was important to them. The method described for both surveys explained the sampling methods used, and the use of online survey platforms and social media as a recruitment tool.

Chapter three comprises the results of the case study of Ngaio Marsh. The analysis includes a biography of Ngaio Marsh, which illustrated her background and the influences that shaped her writing, and directing career in theatre. These influences were further examined in the context of her research methods for her crime fiction novels, and whether she cared about ensuring the accuracy of science in her novels. The case study also examined Ngaio Marsh’s social and self-awareness of the potential for her fiction to influence her readers’ knowledge and the potential for copycat crime. This case study gave a historical perspective on the thesis question, and gave an opportunity to explore whether the attitudes, motivations and concerns of authors in the past reflect those of the modern day author.

Chapter four is the analysis of the results of the author survey: *Writing science into crime fiction: Authors’ attitudes to forensic science in their work*. It presents the quantitative data gathered by the survey along with the qualitative data gained from open text boxes included in the survey.

Chapter five analyses the results of the reader survey *Do you believe the science you read in crime fiction?* It too presents the quantitative data collected from the survey and the qualitative data sourced from the open text boxes.

Chapter six draws the theory and results of the three parts of the research together by first discussing the results of each, then bringing them together into a cohesive discussion. It demonstrates how each thread contextualises and informs the others, weaving them together and discussing what they and their relationships say about the communication of science through crime fiction, and why this is important. It states the limitations of the research and avenues for future research before presenting the conclusions drawn of this study.
1 Chapter One: Introduction and Literature Review

Crime fiction is one of the most popular genres of fiction amongst book readers. In a recent survey, of the 79% of United States of America (USA) readers who indicated they read fiction, 48% reported they read mystery, thriller and crime fiction (Corso 2010). In New Zealand sales statistics by volume, crime fiction represented 6.8% of total book sales (including non-fiction) in 2014. In Australia this was 5.8%, in the United Kingdom, 8.6%, and 5.8% in the USA. ²

Crime fiction is a literary genre in which some form of crime is central to the development of the story. It involves the crime or crimes - often murder, their detection, the impact on the victims and the motives of the criminals. Crime fiction encompasses a large number of sub-genres, but the sub-genre most associated with it is detective fiction. Its origins are disputed. Edgar Allan Poe’s The Murders in the Rue Morgue was published in Graham’s Magazine in the USA in 1841 (Curran 2011). It is acknowledged by many as the first true detective story, with different commentators of crime fiction only differing in their opinion on the predecessors of the genre (Rushing 2007). Rushing also states, “With that one story, Poe appeared to invent all of the structures of classic detective fiction…” (Rushing 2007). Others give the distinction to the first full length detective novel, William Godwin’s Caleb Williams, published in 1794, or to Wilkie Collin’s The Moonstone, published in 1868 (James 2009). Rzepka asserts that detective fiction could not exist before the formal establishment of detective branches of the police forces, which did not occur in Britain until 1842 (Rzepka 2005). Similarly, McDermid argues that crime fiction only began with the advent of an evidence-based legal system (McDermid 2014).

² Neilsen BookScan 2014 calendar year result. Purchased data.
The genre of detective fiction lends itself to the inclusion and communication of science, and in particular forensic science, by the nature of it involving an evidence-based and methodical investigation, often by a qualified professional, as part of the plot. The use of science as an integral part of the story has been a feature of crime fiction since British writer Sir Arthur Conan Doyle created the character of Sherlock Holmes in *A Study in Scarlet* in 1887 (Conan Doyle 2013). Conan Doyle, a medical doctor, introduced elements of medical science in his novels through the astute observations of Sherlock Holmes, and also through those of Holmes’ companion, Dr. John Watson. The Victorian era reading public embraced this scientific content, which coincided with an explosion of interest in science stimulated by the works of Charles Darwin and Alfred Russel Wallace, and writers such as Thomas Huxley (Lightman 1997). In the time since Conan Doyle’s *A Study in Scarlet* was published in 1887, science, and in particular forensic science, has become a frequent inclusion in crime fiction. The collection of evidence by detectives, official or otherwise, to solve the crime, whether it be from physical or chemical means, has become an essential and often expected part of the story.

The use of forensic science in crime fiction has been embraced by many writers who have used that science to enhance the narrative and differentiate their works from those who do not. British writer Agatha Christie had a considerable medical and pharmaceutical background. She qualified as a dispenser of medicines by passing the Apothecary Hall examination, and worked at the Red Cross Hospital in Torquay, England, until 1918 (Gerald 1993). She included poison as the means of murder in over half of her sixty-six novels (Gerald 1993). She suggests a reason for including so many deaths by poison in her autobiography. “Since I was surrounded by poisons, perhaps it was natural that death by poisoning should be the method I selected” (Christie 1977, p254). Christie was one of the four ‘Queens of Crime Fiction’ in the Golden Age of crime fiction, along with New Zealander Ngaio Marsh, and fellow Britons Dorothy Sayers and Marjorie Allingham (Lewis 1991). The Golden Age of crime fiction was commonly defined as the period between World War One and World War Two (James 2009). All four women made use of poisons as a
murder weapon, and included scientific content in their novels. For example, the first of Agatha Christie’s sixty-six novels, *The Mysterious Affair at Styles*, used the poison strychnine. Dorothy Sayers used arsenic as the murder weapon in her 1930 novel *Strong Poison*. Marjorie Allingham made use of conium (hemlock) in her 1931 novel *Police at the Funeral*. Ngaio Marsh used an overdose of hyoscine in a surgical theatre situation in her 1935 novel *The Nursing Home Murder*.

In the modern day, the use of forensic science in crime fiction was elevated to a new level by Patricia Cornwell in her 1990 novel *Postmortem* (Cornwell 1992, Head 2011). Cornwell worked at the Office of the Chief Medical Examiner of Virginia, USA, so had a background in forensic science and crime, elements she incorporated into her work through her character, medical examiner Kaye Scarpetta. The reading public embraced the stories and their detailed and often gritty forensic science. From the biographical information on her website “Cornwell’s books have sold some 100 million copies in thirty-six languages in over 120 countries. She’s authored twenty-six New York Times bestsellers”(Cornwell 2015). Cornwell is not alone in using her professional forensic and scientific knowledge to her advantage. Some examples of other professionals in the field of forensics or medical science who have used their experience and expertise to inform their writing, and who have become multi-million copy, best-selling authors include American writers Kathy Reichs (a forensic anthropologist and Professor in the Department of Anthropology at the University of North Carolina-Charlotte), Robin Cook (a medical doctor), and Tess Gerritsen (a medical doctor).

Does the inclusion of scientific content, however, have an impact upon the reader beyond entertainment? In looking at the communication of science through crime fiction, do people believe the science they read in crime fiction? And do they care whether it is accurate or not? A search of the literature indicated there had been no formal research into the attitudes of readers to the science they encountered in crime fiction. Some research had been undertaken investigating how viewers’ perceptions of science were affected by scientific content in television fiction. Orthia et
al. used focus groups to discuss viewers’ responses to an episode of *The Simpsons*, an animated American sitcom. The episode *Lisa the skeptic* was science-rich, and the aim of the study was to see if viewing the episode influenced people’s opinions of science (Orthia et al. 2012). The results showed a large variance in people’s responses, some contradictory. The researchers concluded individual responses were influenced by many factors, including their prior experience with science, religious beliefs, and experiences from viewing other television programmes.

As a crime writer, I was concerned about the possibility of someone using the scientific and forensic information given in my works to undertake a crime or using it to avoid detection. Were other writers of crime fiction also concerned? The issue of copycat crime is one that evokes strong response from individuals and society as a whole. There are many examples of copycat crime attributed to mass media (Surette 2013). These include crimes that have been inspired by fiction in film and television drama, and also news reporting of real life events (Morgan, Geller, and Kazzi 2011). In the USA, high school mass shootings have been upheld as tragic and high profile examples of this phenomenon (Bond 2007). How much of an influence has print media, and in particular, crime fiction had on the occurrence of copycat crime? Research has only uncovered a few examples of copycat crime as a result of print fiction. One of the earliest cited examples is from Conan Doyle’s *A Study in Scarlet*. Sherlock Holmes not only created a legion of fans, but also an imitator. In 1891 Carlyle Harris, a medical student, was charged with the murder of his secret wife Helen Potts. The method he used to give her an overdose of morphine was similar to that used by Holmes’ character Jefferson Hope in *A Study in Scarlet* (Wagner 2006). A more recent high profile example was that of American teenager Barry Loukatis, who in 1996 copied the murder of an algebra teacher from Richard Bachman’s 1977 novel *Rage* which describes a teenager committing a shooting at his school (Bachman 1977). Richard Bachman is the pseudonym of American writer Stephen King. Loukatis shot dead a teacher and two students and critically wounded another at Frontier Middle School in Washington. What is most chilling is that he is...
alleged to have quoted verbatim from *Rage* as he committed the crime - “This sure beats the hell out of algebra, doesn’t it?” (Coleman 2004, p2).

In reading the works of New Zealand crime writer, Ngaio Marsh, it was evident she was aware of the potential for copycat crime as a result of the science and methodology she included in her work. In a number of her early novels the characters discuss that very issue. In her 1935 novel *The Nursing Home Murder*, when discussing a play that mirrors the circumstances and murder of the victim, one of the characters asks the question “I say, do you think that could have given Phillips the big idea?” (Marsh 1983c, p115).

Do modern day writers feel obliged to include accurate scientific information in their fiction? And does the inclusion of detailed forensic science in their works raise concerns about the potential for the education of criminals and copycat crime? Again, a search of the literature revealed this to be an unexplored area. The inclusion of science in crime fiction is contingent upon the knowledge of the writer and their confidence to include it within the context of the story. Investigating writers’ attitudes towards including science in their fiction presented an opportunity to research the communication of science in crime fiction and the potential effects of communicating that science to their readers.

Crime fiction has a large readership. A search of the literature revealed no research into the expectations of readers as to the accuracy of the science they encountered in crime novels. This provided an opportunity to examine reader attitudes to the science they read in crime fiction. Combined with the need for research into writer attitudes, the two facets would provide a point of comparison between reader and writer expectation. This led to the development of the hypothesis and aim of this thesis.


1.1 Literature review

The remainder of this chapter reviews the literature to provide background and understanding on what is already known in the areas that come under the scope of this thesis. The topics included in the review are forensic science, The CSI Effect, learning facts from fictional sources, and science communication. The topics of discussion are varied and distinct, and as such the literature is drawn from a number of academic disciplines.

1.2 Forensic science

Saferstein defines forensic science as “The application of science to those criminal and civil laws that are enforced by police agencies in the criminal justice system.” (Safferstein 2004, p4). Forensic science encompasses many disciplines, including chemistry, physics, biology, mathematics, pathology, anthropology and psychology (Jobling and Gill 2004). As discussed in the earlier introduction, forensic science has been integrated into the plot and narrative of crime fiction since the character Sherlock Holmes was created by Sir Arthur Conan Doyle in 1887 (Schweitzer and Saks 2007).

Although forensic science is used as an integral part of the modern judicial system, rudimentary forensic techniques have been used to solve crime for centuries. One of the first documented accounts of the use of forensic technique to solve a crime occurred in China in AD 1235. A man was slashed to death with a farmer’s sickle. Sung T’zu, a Chinese magistrate, ordered everyone bring their sickles for examination. Upon inspection the sickles appeared clean, but tiny flies gathered on one of them, attracted by minute traces of blood and tissue. Sung T’zu concluded that was the sickle of the murderer (Gunn 2006). He is also credited with writing the first forensic text book Xi Yuan Ji Lu, in 1247, which translates as The Washing Away of Wrongs.
In 1814 Mathieu Orfila, a Spanish chemist, documented the use of analytical science to detect the presence of poisons in human tissue with the publication of his treatise on their detection (Blum 2010). Evidence based applications and presentations of science in courts of law became more frequent in the nineteenth century. Hans Gross, an Austrian magistrate and professor of law at the Karl Franzens University of Graz, published the first text on the use of scientific principles in the gathering and examination of evidence for use in criminal investigations. *Manual for the Examining Justice* was published in 1893 (Grassberger 1956-1957). Gross was credited with founding the field of criminalistics.

As a discipline, forensic science and the importance of the preservation of evidence began in the early twentieth century. One of the pioneers of this was Frenchman Edmond Locard (McDermid 2014). Locard had studied both medicine and law, and in 1910 he opened the first crime investigation laboratory in Lyon, France. He is known for developing Locard’s principle - every contact leaves a trace (Swanson et al. 2011).

Another pioneer in the field of forensic science was British pathologist Sir Bernard Spilsbury, who initially came to attention through his expert testimony in the 1910 trial of Dr Hawley Harley Crippen (Old Bailey Online 1910). He is credited with establishing the use of gloves, separate evidence bags and modern crime scene investigation techniques. Biographer Colin Evans referred to him as the Father of Forensics (Evans 2006). Spilsbury became a ‘celebrity pathologist’ (Burney and Pemberton 2011), although the veracity of some of his work remains controversial. The case and trial of Crippen provided inspiration for a number of crime fiction novelists (Symon et al. 2015).

Advances in medicine and forensic detection techniques accelerated through the twentieth century. These included the ABO blood typing developed by Vittorio Siracusa in Italy in 1923, and Japan’s Saburo Sirai’s work on recognition of group specific antigens in other body fluids in 1925. Luminol as a presumptive test for the presence of blood was developed in 1937 by German scientist Walter Specht (White et al. 2011).
The advent of DNA technology revolutionised the application of forensic science in the criminal justice system. It began in 1984 when British scientist Alec Jeffreys discovered hypervariable loci called minisatellites. (Jeffreys, Wilson, and Thein 1985). Minisatellites consist of a block of tandem repeats of DNA sequence at a particular loci on the genome (Kendrew 2009). The numbers of repeats vary between individuals, and this variation allowed DNA fingerprinting to occur to identify an individual (with the exception of identical twins). The first conviction that resulted from DNA evidence presented in court occurred in 1986. Colin Pitchfork was convicted of a double rape and murder in Leicestershire, UK. The DNA evidence presented in that case absolved a suspect who had previously confessed to the crime, so the case was also the first to prove innocence (Jobling and Gill 2004).

DNA technology has advanced with the development of polymerase chain reaction (PCR) methods that amplify the DNA allowing successful analysis from minute traces of DNA (Jobling and Gill 2004). In the 1980s a clearly visible blood stain or semen stain was required in order to extract a DNA sample. Low copy number DNA samples and analysis has reduced the amount of trace needed, but has consequently required high standards of collection, handling and processing (Robertson 2012). In the criminal justice system DNA evidence has become a mainstay for prosecuting cases, but is still used in conjunction with other evidence. Robust technique and chain of evidence protocols have had to be developed to prevent challenges for admissibility to court (Peterson and Leggett 2006). DNA evidence and forensic science in criminal investigations has also become a fascination for the entertainment industry.

1.3 The CSI Effect

The Colombia Broadcast System (CBS) crime drama CSI: Crime Scene Investigation televised in the USA for the first time in October 2000. The
show’s use of new digital special effects to produce hyper-realistic images of traumatic injury, for example bullet trajectories through human tissue, and its portrayal of high tech forensic science excited the television public and quickly lead to a large viewership and to the spin off series CSI Miami and CSI New York. Debate soon erupted in the criminal justice system and academia about the potential adverse effects of the programme and its depiction of the forensic technologies available to law enforcement and how they were used in a court of law. The term ‘The CSI Effect’ was first used in 2002 on the CBS Early Show. Following that an article in Time Magazine defined the CSI Effect as “a growing public expectation that police labs can do everything TV labs can” (Kluger 2002).

Anecdotal reports began to appear of the programme’s perceived influence on jurors in criminal trials (Houck 2006). Media reporting of this fueled debate and prompted research (Cole and Dioso-Villa 2006, Harvey and Derksen 2009). Surveys of the number of newspaper articles that mentioned the CSI Effect demonstrated a marked increase in the use of the term from 2005. Of the United States media surveyed, mentions of the CSI Effect rose from 12 in 2004, to 56 in 2005 and 78 in 2006 (Cole and Dioso-Villa 2009). The most common theme of these articles was unrealistic juror expectations.

Cole and Dioso-Villa tabulated what they defined as individually identifiable CSI Effects (Table 1), (Cole and Dioso-Villa 2009).

Cole and Dioso-Villa suggested that only three of the listed effects were detrimental to society – the strong prosecutor’s effect, defendant’s effect and police chief’s effect. They proposed in terms of general media’s interpretation of the CSI effect, that the media concentrated on the strong prosecutor’s effect, where the influence of CSI and its portrayal of the forensic science available to law enforcement and its use in court could result in more acquittals due to jurors expecting more scientific evidence (Cole and Dioso-Villa 2009).
Table 1: The Many Effects of CSI: Typology of CSI Effects Found in Media Accounts (Cole and Dioso-Villa 2009, p1345).

<table>
<thead>
<tr>
<th>Effect name</th>
<th>Effect on</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strong prosecutor’s effect</td>
<td>Jurors</td>
<td>Acquit in cases in which they would have convicted had CSI/never existed</td>
</tr>
<tr>
<td>Weak prosecutor’s effect</td>
<td>Prosecutors</td>
<td>Compensate for absence/weakness of forensic evidence</td>
</tr>
<tr>
<td>Defendant’s effect</td>
<td>Jurors</td>
<td>Afford greater credibility to forensic expert witnesses</td>
</tr>
<tr>
<td>Producer’s effect</td>
<td>Jurors</td>
<td>Know more science</td>
</tr>
<tr>
<td>Educator’s effect</td>
<td>Students</td>
<td>Attraction to careers in forensic science</td>
</tr>
<tr>
<td>Police chief’s effect</td>
<td>Criminals</td>
<td>Adopt countermeasures to prevent detection through forensic evidence</td>
</tr>
<tr>
<td>Tech effect</td>
<td>Jurors</td>
<td>Hold higher expectation for forensic evidence because of actual developments in forensic technology</td>
</tr>
<tr>
<td>Victim’s effect</td>
<td>Crime victims</td>
<td>Expect forensic testing for all crimes</td>
</tr>
</tbody>
</table>

The first study of juror expectations was undertaken in 2006 (Shelton, Kim, and Barak 2006). They concluded that there was no direct causative impact on a juror’s expectation of scientific evidence presented at trials as a result of watching CSI or other similar television shows. They proposed that increased juror demands for scientific evidence was more a result of broader advances in technology and how information about it was disseminated, including through popular media. They labeled this a ‘tech effect.’ Research undertaken by Poldas did not support a CSI Effect that resulted in a wrongful acquittal when a guilty verdict was appropriate.
Poldas concluded that the opposite was potentially true, that the case for the prosecution was strengthened by the pro-police, pro-forensic science aspect of the show (Podlas 2006).

Hughes et al. undertook a postal survey of 133 United States judges from Kentucky, USA, for their perceptions of change in the criminal justice system as a result of the CSI effect. When asked if television shows like CSI had caused them to change how they administered their courts, of the 58 who responded, almost 80% indicated they had not. This was despite 60% of judges responding positively to the statement that shows like CSI have had an impact on the administration of justice in court. They observed an increase in demand for forensic evidence from jurors, but that did not translate into an increased use. The changes tended to be behavioural on the part of prosecutors and defence, and also in jury selection (Hughes and Magers 2007).

Harvey and Derkson lamented the lack of systematic research to identify if a CSI effect existed, and if it did what its ramifications were. They concluded

> The relationship between popular television, and courtroom and criminal justice practices needs to be interrogated more deeply and systematically before any conclusions can be drawn about whether the CSI effect is primarily a media creation, or a new set of social practices (Harvey and Derksen 2009, p20).

Lawson coined the term “CSI infection” to recognise the fear within the criminal justice system that the CSI effect has created “CSI Infected Jurors” (Lawson 2009, 122). Her review expanded the focus of the CSI debate to encompass how the “popular culture phenomenon” had impacted upon trials by examining real life experiences of litigators, judges and jurors in trials. The conclusion was that there was a CSI effect occurring in American courtrooms, and that in order to protect fairness in the criminal justice system, it needed to be controlled.
Ramsland looked at the CSI effect from a social cognition aspect (our tendency to make judgments based on our expectations), and the heuristics and cognitive shortcuts we use that can be affected by television programmes and the way they impart information as story (Ramsland 2009). She cited studies where mock jurors were presented with information in story form, rather than as blunt facts. The evidence presented as story influenced the jurors more than evidence presented as a series of facts. This was particularly so with complicated scenarios. This was due to the structure and organisation of story helping jurors with comprehension, and therefore an ability to reach a verdict (Pennington and Hastie 1992).

Cole and Dioso-Villa revisited the CSI effect in 2009. They examined the influence of the media reporting of the CSI effect, and how juries could be subject to media bias. Despite studies indicating there was no discernable CSI effect, their survey provided evidence that the media reporting was alarmist and reported the phenomenon as fact. Cole and Dioso-Villa also conducted a survey of acquittal rates in the United States before and after 2000, the year CSI first emerged. They found no statistically significant correlation between the broadcasting of the CSI shows and change in acquittal rates (Cole and Dioso-Villa 2009). They concluded that changes in acquittal rates were very likely due to chance. They noted there had been a trend of increased acquittal rates from 1997, before the show’s release. Overall they concluded, “the CSI effect would seem to embody the law’s anxiety about the threat to its legitimacy as a truth-producing institution posed by a rival truth-producing institution called ‘science’” (Cole and Dioso-Villa 2009, p1373).

A study conducted by Shelton et al. confirmed earlier findings that a CSI effect did not exist. They surveyed summoned jurors before the jury selection process and assessed their television viewing habits. They then presented a number of courtroom scenarios and assessed what kind of evidence the jurors expected to be presented with, and whether they would demand certain evidence before being able to make a deliberation. They found that CSI viewers had a higher expectation of evidence than non CSI viewers, but this expectation for scientific evidence was rational
and case specific. Shelton et al. proposed an indirect-effects model of mediated adjudication that took into account the tech effect, media effect and CSI effect. “The process by which jurors deliberate on criminal allegations is far too complex and the impact of the media generally on those outcomes is far too diverse to lie at the feet of any one particular cause” (Shelton, Kim, and Barak 2009, p40).

Kruse had described CSI as a cultural performance and its science as “wishful-thinking science.” As a cultural performance, CSI and its like provided the basis from which the audience formed their own view of the criminal justice system. This included the unlikely occurrence in the real world, of a perfectly solved crime (Kruse 2010). Durnal summarised his review by stating a CSI Effect exists in the context of it exerting an influence on the criminal justice system as a whole, rather than influencing the individual juror one way or the other (Durnal 2010).

Shelton revisited the CSI Effect and remarked on what he called a “stubborn insistence” on its existence that was perpetrated by actors in the criminal justice system believing in the strong prosecutor effect. Their belief was created by anecdotal stories from prosecutors, academic scholars, and the news media reporting it (Shelton 2010). Ley et al. expanded the research base by further extending the definition of factors that formed a CSI Effect. They also examined them in the context of media effects theories such as cultivation theory and social cognitive theory. They framed their investigation specifically in terms of the portrayal of DNA evidence and the subsequent public expectation of its reliability and use in the judicial system. Viewers’ responses and beliefs were varied depending on their personal and social background, including ethnicity, gender, religion and culture (Ley, Jankowski, and Brewer 2012).

Harriss examined the strong prosecutor effect and how it could be diminished by improving the genre literacy of viewers. Genre literacy was an understanding of the structure of the genre and the language specific to it. He argued that the audience would form conscious interpretations of the forensic science, rather than unconscious if they recognised the medium was a stylised artistic representation of the criminal justice
system. He, like a number of previous authors made the point that CSI’s constant reinforcement of “physical evidence cannot be wrong. It doesn’t lie,” strengthened the perception that science is truth, whereas other forms of evidence, such as witness testimony and circumstantial evidence were of less value (Harriss 2011, p4).

A study of the CSI Effect was undertaken by Cole, in this instance examining reporting in the media of the CSI Effect from a public understanding of science view point. Cole’s approach was to survey media claims that CSI distorted the public view of forensic science based on three broad parameters including the capacity of crime laboratories, evidence and the forensic scientist. The survey involved coding almost 400 news items on the topic of the CSI Effect and identifying the justice system actors who contributed to the articles as interview subjects. They were also coded to identify distortion themes that were communicated by CSI type programmes. Public understanding of science examinations had concentrated on the deficit model of social problems, which operates on the belief that the public’s lack of faith in science and technology is based on ignorance, and that teaching them scientific knowledge will reverse their scepticism and make them support science (Dickson 2005). The deficit model is discussed in more detail in the science communication subsection of this chapter (Section 1.6). Cole argued the perceived social problems attributed to CSI by media were based on a surfeit model - the public has too much information about forensic science (Cole 2013).

Prisoners are a group that has a unique perspective on the CSI Effect. Prainsack and Kitzberger interviewed 26 Austrian prisoners to ascertain their knowledge and conceptualisation of DNA and forensic technologies. When asked where they gained their knowledge of DNA, almost all of the participants cited CSI and similar television programmes. Prisoners indicated they were well aware of the fictional portrayal of the criminal justice system, so did not fully trust it as a source of information, but when combined with their personal experience and discussion with fellow prisoners about methods of eluding detection they did gain knowledge that aided them in managing the risks of detection (Prainsack and Kitzberger 2009).
Machado undertook interviews with 31 prisoners in Portugal to examine their perceptions of forensic science. Again, many prisoners mentioned CSI as the main source of their knowledge of forensic science and crime scenes. Others mentioned other media such as television news and documentaries. Fellow inmates were also sources of information, as was personal experience. She called this a “(credible) distortion of reality effect,” that CSI was recognised as a work of fiction, but contained some degree of truth (Machado 2012, p273).

The attitudes of writers and producers of television fictional crime drama on the scientific content in their shows were gathered by Kirby (Kirby 2013). He interviewed them to see how they used forensic science in their stories to create visually appealing scenes, develop characters, advance the plot and develop themes. He argued that the creators maintained a flexible view on scientific realism that was based on what was possible, rather than what was probable. He cited Josh Berman, producer of CSI and Bones, who said nothing was made up. However, even if a technique was only used by one laboratory, it was justification to be able to use that technology in the show as a ‘fictional conceit,’ which allows events that are rare or unlikely in the real world to occur as the norm in a fictional one. Barbara Machin, a writer for Waking the Dead, also used unusual science to create the potential for interesting visual imagery. For her, exaggerating or conversely simplifying forensic science to advance the story was not the same as being inaccurate.

The CSI Effect is a relevant example of how the presentation of science in a fictional forum via mass media can have an impact on how the public understands and perceives science and technology. The impacts of this incidental learning from a fictional source on society have been demonstrated to be both positive and negative.
1.4 Learning facts from fiction: The effective communication of knowledge

Do people learn facts from fictional sources, and how does this process work? A substantial amount of literature focuses on the effects of television viewing and other visual media on viewer perceptions of reality. Shrum gives a thorough overview of the theories of processes underlying the acquisition and assimilation of social information as a result of visual media. This ranges from the effects of viewing on beliefs about social norms to aggression and violence (Shrum 2002).

In the context of this thesis, interest is in how people learn and value information they encounter in the written word, and if they believe its authenticity. Appel and Richter stated that it is not an obligation of authors of fictional texts to provide in depth knowledge to readers, and that it would be a paradox to oblige them to do so. Despite this, the nature of fiction is such that it contains a lot of factual information as well as invented content. This has the potential to have an impact on the viewer or reader.

In novels or television dramas we find true facts mixed with invented ones. As no one has ever convincingly argued for an automatic cognitive switch or toggle that prevents fictional information from entering real world belief systems (Gerrig 1993) it seems fictional information, even if blatantly false, alters our view of the world (Appel and Richter 2007, p113).

Much of the literature on serendipitous information finding is in the field of library information science. This tends to concentrate on individuals seeking information, as opposed to accidental learning through fiction. Erdelez describes this process as information encountering. “Information encountering is a memorable experience of unexpected discovery of useful or interesting information” (Erdelez 1999, p25). Similar terminology includes “accidental discovery of information” (ADI), and “incidental information acquisition” (IIA).
Erdelez placed information encountering in the context of an individual searching for information on one topic and then finding something interesting about another. Her research explored this with individuals in an academic environment, and her results divided readers into four categories based on their level of information discovery. Non-encounterers were individuals who did not recall finding other interesting information accidentally while searching for a topic. Occasional encounterers had some recollection of finding other information, but did not see it as important. Encounterers enjoyed discovering other topics of interest while searching for something specific, but did not see this process as part of their general information finding strategy. The final group she proposed were “super encounterers.” This group actively employed incidental information discovery as part of their strategy for research. This group was interesting as they frequently reported they looked for information that may also be useful for those around them – family, fellow researchers. Erdelez proposed super encounterers were more sensitive to potential sources of information, including that in their daily life environment. She cited the example of a researcher finding relevant information for a project in a magazine left in the laundry of her apartment block (Erdelez 1999).

Another relevant aspect of super encounterers was their preference to using print media as a source of information over the Internet. Erdelez argued that this may be as a result of the immense amount of information available on the Internet overloading the capacity of the super encounterer to process it (Erdelez 1999).

Sheldrick Ross addressed information discovery while reading for pleasure. She called these non-goal orientated transactions with texts. The paper reported results from interviews with 194 readers and concentrated on how readers selected books, and also how the information they discovered enriched their lives. Two points are relevant to the scope of this thesis. Ross argued that “when reading extended narrative forms, particularly biography, history, and fiction, readers bring to the texts their own individual concerns and interests, which act as a filter to highlight those aspects of the text that speak to their concerns” (Sheldrick Ross 1999,
Also, although readers chose books for pleasure, when interviewed they responded that they often discovered information helpful and relevant to their lives. Ross called this “finding without seeking” and emphasised in her discussion the role of the reader in recognising the relevance of elements of the narrative or information in the book within the greater context of their world (Sheldrick Ross 1999, p785).

How readers process the information they find in fiction is dependent on their relationship with the story and prior knowledge. Prentice et al. undertook a study of university students from Princeton College and Yale University to examine how students’ personal experiences and their attitudes affected their belief in stories that talked either about events at their own college (Princeton or Yale), or at the other college (Yale or Princeton) (Prentice, Gerrig, and Bailis 1997). Students were influenced more by information placed in the story about the other institution than by that in the story about their own institution. This result supported the hypothesis that readers will accept information as correct unless they have reason to believe otherwise, as belief is the default. In the study, when participants were unfamiliar with the environment, they were more susceptible to the false information planted in the story, as opposed to recognising as incorrect information set in their known environment. They concluded, “it is not disbelief that must be suspended when one reads fiction; rather, it is belief that must be overcome when one evaluates fact” (Prentice, Gerrig, and Bailis 1997, p419).

Marsh et al. conducted a series of experiments involving participants reading a story, then after a seven-day delay they were given a general knowledge test to investigate how they incorporated knowledge learned from fiction into their general knowledge (Marsh, Meade, and Roediger III 2003). The researchers were interested to see if this was done by a process of integration (where the reader linked the new knowledge to their existing knowledge,) or by compartmentalisation (where they held these new facts obtained from a fictional source separately to their pre-existing general knowledge.) Compartmentalisation would suggest the reader did not trust the accuracy of the fictional source. Correct information, and also misinformation, was incorporated into the stories.
The aim was to investigate if the readers used facts presented in the fictional story in a later general knowledge test, and also to access whether the readers were aware of the source of their answers when completing the test. By combining these two judgments the researchers could understand the relationship of the two processes in learning facts from fiction. If the participant forgot the source of their information was from the story and they asserted they already had that knowledge, that would support integration. If the participant remembered the fact came from the story that would support compartmentalisation. Their findings supported a hybrid of the two as the participants had an increase in general knowledge and remembered the story source. Of particular interest was that misinformation was also incorporated into their general knowledge. They concluded “Fiction is a rather unusual source – knowing that an item came from a fictional source does not necessarily mean that it is wrong. In addition, as suggested earlier, fiction may be a special case in that subjects approach it less critically than other sources” (Marsh, Meade, and Roediger III 2003, p535).

Lewandowsky et al. (2012) discussed literary fiction as an inadvertent source of misinformation. They stated that information was extracted by readers from a source that was clearly fictional, but as that source contained valid information about the world, incorrect information could also be assimilated and taken as real, even though there was no intent to mislead (Lewandowsky et al. 2012).

Gerrig also developed experiments to ask if information acquired from fiction was compartmentalised, or if it was incorporated into general knowledge. They used context details and context-free assertions to assess the degree of compartmentalisation or incorporation. They found evidence of both forms of information handling and suggested readers used a hybrid way of assimilating information. They stated “the results of these experiments suggest that readers bring a reasonable degree of sophistication to the representation and use of fictional information” (Gerrig and Prentice 1991, p340).
Hovland and Weiss undertook a study of college students to examine how source credibility affected the amount of information the students learned from a set of texts, as well as how their opinion on the issues presented in the texts were swayed by sources deemed to be of high credibility or low credibility (Hovland and Weiss 1951). Results indicated there was no difference in the amount of information learned from the text by a high credibility source compared to a low credibility source. This result was also the same after an elapsed period of four weeks. There was, however, a marked difference in the immediate change in opinion on the material. Where the source of information was a high credibility writer there was a greater change in opinion to agree with that source’s stance than when the same material was presented by a low credibility writer. This effect was diminished by time. After a four-week period, agreement with the high credibility source decreased, and that with the low credibility source increased to the point where they were equal. The authors explained this phenomenon as a sleeper effect. Where the source was trustworthy, the decrease in opinion came about as a result of forgetting the content. In the case of the low credibility source, the participant’s non-acceptance of their reliability decreases over time (Hovland and Weiss 1951).

Appel and Richter commented “if such a sleeper effect were demonstrated experimentally, this would establish the fictional narrative as a powerful means of altering our view of the world” (Appel and Richter 2007, p114). They conducted an experiment to test the sleeper effect based on the persuasive effects of fiction, i.e. that readers are momentarily transported into the fictional world, and that this alters their expectation and frame of reference for the information they encounter. In their experiment, 81 participants read a fictional story that contained both true and false information, or they read a control story. They were assessed on their level of belief immediately after reading the story, and then after a two-week delay. Appel and Richter’s results confirmed the existence of a sleeper effect due to narrative persuasion. They stated that readers of fiction knew that some of the information they encountered may not be true and bore that in mind when evaluating its validity, but a sleeper
effect still occurred if the reader’s memory of the source of the content lapsed over time, and if their memory for the narrative was stable.

Green discussed how readers were transported into the narrative story and how the level of this transportation affected their perceived realism (Green and Brock 2000). A transported individual was emotionally and intellectually involved in the story. Their study indicated transported readers showed more story-consistent beliefs whether or not they had previous personal experience with the subject matter.

Schank and Abelson examined the tendency of people to remember and retrieve information in the form of stories (Schank and Abelson 1995). They argued stories are the building blocks of memory, knowledge and how we communicate. They proposed that not only is all human knowledge built on stories of past events and experiences, but that any new experiences are then compared to and interpreted based on our store of these old stories. Slater stated that “the use of story-telling to influence behavior is at least as old as Aesop and is deeply ingrained in Western as well as non-Western cultures” (Slater 2002, p158). Slater said the effect of fictional narratives for entertainment on people’s beliefs, behaviour and their values was an important issue for discussion by communication scientists.

The use of narrative to convey information uses a different cognitive pathway than a purely evidence-based presentation or that based on argument. Dahlstrom and Ho stated information communicated through a narrative increased engagement, would often increase knowledge, influence beliefs and could persuade an otherwise resistant audience. They said, “As such, narratives hold promise for improving the effectiveness of science communication to non scientist audiences” (Dahlstrom and Ho 2012, p593).

---

3 Aesop was a fifth-century BC Greek fable teller
1.5 Ethical considerations in communicating science through crime fiction

The literature surrounding the ethics of communicating science in fiction concentrates on the purposeful use of narrative to convey scientific information in an educational setting, rather than accidental acquisition of scientific knowledge through reading fiction for pleasure. Dahlstrom and Ho suggested three main ethical considerations when using narrative as a means to communicate science purposefully. Firstly, “What is the underlying purpose of using narrative: comprehension or persuasion?” (Dahlstrom and Ho 2012, p592). They asked, was science communication’s role to enable an individual the autonomy to make an informed choice, or to guide an individual towards a pre-determined outcome? Secondly, “What are the appropriate levels of accuracy to maintain within the narrative?” As narrative is context dependent, different levels of accuracy may be appropriate for different situations. Thirdly, “Should narrative be used at all?” Narrative information was processed through a distinctly different cognitive pathway than paradigmatic pathways, and was more persuasive. The science communicator needed to gauge the appropriate means of conveying the information they wanted to disseminate, and the reason for communicating it.

Discussion from within the crime writing community on the ethics of crime fiction has focused on levels of violence portrayed in crime fiction, or social and political realities. A number of academics and commentators cite the works of Ian Rankin as a basis for discussing the ethics of crime fiction (Bell 2008). Rankin proposed that crime fiction provided an ideal vehicle to discuss issues faced by society. It placed a spotlight on the darker side of society, the margins where normal rules were disregarded (Rankin 2007). It also served as a means for people to ask questions about what it meant to be a part of their society. “Who are we, where do we come from, how do we feel about racism, sectarianism, Anglophobia, identity, the political process, our place in the wider scheme of things?”
(Rankin 2005, p172). Berges highlighted the debate over whether ethical criticism should examine works of literature as works of art, or whether they should be morally valuable and reflect culture and society (Berges 2003). Other crime writers have questioned whether writing about murder for entertainment and income is socially acceptable. South African writer, Margie Orford, asked if writing fiction where you have characters commit murder wrong? “It feeds the family, but can it be ethical?” (Orford 2010, blog page).

There is little literature on the subject of the ethics of communicating science through fictional popular media, and the ethics of providing accurate scientific information in popular fiction. This is an area that would benefit from further research and debate.

1.6 The Communication of Science

This thesis explores the communication of science through crime fiction, but how is science communication defined as a discipline? Ogawa stated that the science communication community had difficulty defining the type and nature of activities that fell under the title of science communication, and therefore how to define and analyse them (Ogawa 2012). He proposed a design approach to science communication which looked at the stakeholders intention, i.e. their goals for each science communication intervention and the means by which they might reach them. This was in the context of the relationship between science and society, i.e. scientists and the public. By looking at the intent of the stakeholders, it allowed for differences in the values within the science communication community. This is a useful consideration when looking at the intent of authors in communicating science in crime fiction. A search of the literature has not indicated the presence of research into the intent or attitude of authors when including science in their fiction.

One definition of science communication, as supplied by Bryant, is “…the processes by which the culture and knowledge of science are absorbed into the culture of the wider community” (Bryant 2003, p357).
This explanation provides a broad conceptual definition of science communication at a societal level, but it lacks detail and applicability to the individual. Burns et al. offered a more comprehensive definition of science communication that incorporated personal responses to science. They called this the vowel analogy:

**SCIENCE COMMUNICATION** (SciCom) may be defined as the use of appropriate skills, media, activities, and dialogue to produce one or more of the following personal responses to science (the vowel analogy):

- **A**wareness, including familiarity with new aspects of science.
- **E**njoyment or other affective responses, e.g. appreciating science as entertainment or art.
- **I**nterest, as evidenced by voluntary involvement with science or its communication.
- **O**pinions, the forming, reforming, or confirming of science-related attitudes.
- **U**nderstanding of science, its content, processes, and social factors.

Science communication may involve science practitioners, mediators, and other members of the general public, either peer-to-peer or between groups (Burns, O’Connor, and Stocklmayer 2003, p190).

This definition incorporates social elements and cultural factors in how science reaches people in their everyday lives rather than viewing science communication only as a means of correcting a lack of knowledge, reflected by the deficit model of the public understanding of science.

The term ‘deficit model’ originated in the 1980s to summarise a number of assumptions in science communication at that time (Ahteensuu 2012,
Brossard and Lewenstein 2009). These assumptions included that the public was ignorant of science and had a negative attitude towards it (Sturgis and Allum 2004). This negativity was caused by their lack of knowledge, and therefore scientists could improve both situations by making the public more scientifically literate. This could be achieved with one-way communication from scientists to the public (Ahteensuu 2012). Science communicators concentrated on rectifying the deficit by attempting to educate the public with scientific facts in the hope that the public would then understand them and the associated issues the scientists were wanting to draw their attention to (Bubela et al. 2009). The deficit model was widely criticised as it did not recognise the many factors that contributed to science communication, but instead concentrated on the assumption that the public’s ignorance of science and associated issues was the sole reason for their lack of support of it (Simis et al. 2016).

Sir Earnest Rutherford is cited as having said that all scientists should be able to explain their discoveries to a barmaid, indicating the language used and level of content should be easily accessible to the layperson (Fleming 2009). Science communication has been a part of oral tradition for thousands of years, and that the information passed through oral storytelling of myth and legend helped to form the body of knowledge of many cultures (Mazzocchi 2006). In the Pacific region there are distinct parallels in the myths and legends of the many Polynesian nations, and their narratives often carry similar themes despite their peoples being geographically distant and having been separated from shared origins by thousands of years. An example is the stories woven around Maui, a mythical hero of New Zealand Māori. Marsden asserted that myths and legends were not simple superstitions or stories invented to entertain. He stated

Myth and legend in the Māori cultural context are neither fables embodying primitive faith in the supernatural, nor marvelous fireside stories of ancient times. They were deliberate constructs employed by the ancient seers and sages to encapsulate and condense into easily assimilable forms their view of the world… (Marsden 2003, p2).
Cultural and environmental knowledge was transmitted through the mode of storytelling. This fits into Bryant’s definition of science communication. It also has significance for the communication and teaching of science today. Hikuroa set out to illustrate that “significant components of matauranga fit the criteria of science” (Hikuroa 2012, p1). In a historic context, he illustrated how myths and legends imparted valuable knowledge about the physical world, such as seasons, and food production. He proposed this made science contextually relevant for Māori, and was important in helping Māori engage in it in the current day. In New Zealand, Māori are under-represented in the science fields at a tertiary level and have less success in science at secondary school levels (Cowie, Jones, and Otrel-Cass 2011). Government and educational groups are trying to find ways to narrow this gap in science education and engagement. Hikuroa argued that using elements of Māori oral storytelling tradition could benefit modern day science education. He presented Maui as a scientist and that “Maui embodies the inquisitive component that is missing from science teaching today” (Hikuroa 2012, p2).

The communication of science to the general population through print media has been in existence since the eighteenth century. Popular science books were published and embraced by the reading public. An example is Algarotti’s Newtonianism for Ladies (1737), which specifically targeted the female reader demographic (Mazzotti 2004). Newspapers and periodicals in the nineteenth century printed transcripts of lectures by the biologist Thomas Huxley and regular scientific content. The term ‘scientist,’ as a noun, was first used mid-nineteenth century (Turney 2008). Until this time the word “philosopher” had been used to describe a person who practised science, but with the expansion of the sciences this was no longer descriptive enough. The word “scientist” was first proposed in the Quarterly Review in 1834 by the reviewer William Whewell. It was not well received initially, and acceptance of “scientist” as a collective noun took time to gain traction (Ross 1962).

In the modern day, print magazines such as Popular Science, Cosmos, BBC Knowledge, and New Scientist bring science content and latest technologies
Communication of science as an academic discipline is much more recent. The first peer reviewed journal for the field was published in 1992 – Public Understanding of Science (Bucchi 2008). The gap between scientist and public, and how information and its relevance is transmitted from one to the other, had caused much debate. There had also been discussion about what scientific literacy was, and what this meant for society (Maienschein 1999). Some scientists believed that the public was “scientifically illiterate” (Weigold 2001). This observation was based on research into the public’s awareness of science, knowledge and interest. The early surveys were interpreted as concluding the public’s knowledge of science was lacking, and were based on a deficit model which equated science and scientists with having knowledge and the public having inadequate knowledge (Burns, O’Connor, and Stocklmayer 2003). This theory has been criticised, as the ability of the public to answer questions about science and their understanding or engagement with it are not so simply defined. The deficit model tended to see science communication as a one-way top-down flow from scientist to public, and was scientist driven (Miller 2001). The deficit model also failed to factor in social and cultural influences on the publics’ engagement and understanding of science. Sturgis and Allum stated “It is quite clear that culture, economic factors, social and political values, trust, risk perception, and world views are all important in influencing the public’s attitude towards science” (Sturgis and Allum 2004, p58). They tempered this statement, however, with the comment that this did not preclude scientific knowledge also having a
strong effect on their perceptions and that a scientifically literate person and a poorly informed person would not form their opinions about science in the same way.

A ‘contextual approach’ to public understanding of science gave more consideration to social factors and lay knowledge. This approach looked to sociology, history and philosophy, and saw public knowledge about science as a dialogue rather than a monologue (Miller 2001). Evaluating and understanding public knowledge was not about the public being able to regurgitate scientific facts. Wynne commented on the use of surveys, a form of assessment that had been used to evaluate factual knowledge, and remarked that as they took the participant’s responses out of their social context, the analysis could not factor in contextual variables, and therefore, did not provide a full picture of their scientific literacy (Wynne 1995). But how could you measure the public’s scientific literacy?

Sturgis and Allum argued that the deficit model and the contextual perspective could be integrated “in a more complex and complete account of how and what people know about science and the context in which it affects their general favourability toward science and the scientific community” (Sturgis and Allum 2004, p59). The use of surveys to gauge contextual knowledge was challenging. They gathered quantitative data, but it was difficult to analyse the social and other factors such as economic factors, political views, and trust. Sturgis and Allum wrote there was value in using the survey format to assess public knowledge on topics of interest. They used the example of the level of an individual’s political knowledge having a large impact on their political leanings, and whether they would act upon this by voting. They argued that with political knowledge people tended to be ‘generalists’ and that their knowledge of matters political was predictive of their knowledge in other fields - in this instance scientific knowledge. They developed and undertook a survey that aimed to measure more contextualised public knowledge of science, within the limitations of the survey format. They noted that there would be two criticisms of their approach and conclusions: that a quantitative survey approach was not suitable for the questions they posed; and the process of defining the variables in a general attitude towards science,
textbook knowledge of science, and an institutional knowledge was flawed. They concluded that “both deficit and contextualist perspectives help to explain how, why, and under what conditions knowledge of many kinds is important in determining public attitudes towards science and, second, that survey-based approaches are by no means unsuitable for research into public understanding of science from a “contextualist” theoretical perspective” (Sturgis and Allum 2004, p68).

Stocklmayer and Bryant reviewed public surveys designed to be comparative measures of the public’s knowledge of science (Stocklmayer and Bryant 2012). They compared them to the results of a study in which scientists were presented with the same survey as that used to assess the public’s knowledge. Some scientists were uncertain of the answers, particularly if the question was not from their field of scientific interest. They concluded that the use of those surveys to assess the public’s knowledge of science was not meaningful in that it did not give an indication of the public’s engagement with science. They argued that researchers did not know what science the public valued, or what they would find useful. They recommended that as opposed to a deficit model of the public understanding of science, an asset-based model of knowledge which looked at the context of science and scientific issues in the lives of the public and the skills they applied to them was more useful. This set the discussion of what the public should know in a cultural and environmental context (Stocklmayer and Bryant 2012).

Despite the maturing of science communication as a discipline and a recognition of the complexities of cultural and environmental context being taken into consideration in the communication of science, Trench questioned whether the deficit model was superseded (Trench 2006). He argued that a deficit model was still the default position of many scientists and organisations. He did temper this with an acknowledgment that many scientists recognised that models of science communication were complex than categorising them into a one-way or two-way model and that different models could co-exist. He discussed a framework whereby three base communication models were examined: Dissemination or deficit, Dialogue, and Conversation or Participation (Trench 2008).
Bucci cited four main levels of science communication posited by Cloitre and Shinn (1985) that fed back into each other in a continuum, informing each other (Bucchi 2008). These levels were the Intraspecialist level – where communication occurred at the peer reviewed specialist journal level, with citation of other work, experimental work and data gathered from experiments or observation. The Interspecialist level included non-specialist journals such as *Nature* and papers given at conferences. The Pedagogic level was textbook science, which summarised the cumulative knowledge of science. The final level was the Popular level, which included television documentaries, newspaper articles. This thesis places fiction and its potential for communicating science into the “popular level” ascribed by Bucci.

Stocklmayer also reviewed models of science communication, from the simple transmission of information predominant until the end of the twentieth century, to models of engagement that view scientists and the public as equal partners in science communication activities (Stocklmayer 2012). She discussed a spectrum of models from one way communication, which she stated most current practice is, to knowledge building using partnerships of players. She proposed a three dimensional model that incorporated one-way information, knowledge sharing and knowledge building. This model described many facets, including the actors involved, their aims and intended outcomes, and their modes of communication. It included actors who would not always consider themselves to be science communicators, eg. Science historians, those involved in mass communication, journalism and cultural studies. In this model writers of fiction would be included in science media.

Longnecker proposed an integrated model of science communication expressed in the form of a koru, or young fern leaf, with facts being nutrients in the soil, the roots being the channels of information bringing it to the individual – the growing plant. This model had three main components; the communication of information, how the individual engaged with that information, and then how they used it (Longnecker 2016). The koru model considered identity as being central to the effectiveness of science communication as it determined how an
individual engaged with that information. This acknowledged the role of an individual’s pre-existing knowledge, beliefs and attitudes and their social environment in their acceptance or rejection of information. This centrality of identity as key emphasised that how an individual accepted information and then used that knowledge was complex (Longnecker 2016).

The variety and complexity of models of communication of science indicate there is no one size fits all solution or measure, and that the needs and desired outcomes for all actors, scientist and public, is influenced by many variables, including social, environmental and contextual.

1.7 Conclusion

Developments in forensic science and its applications in the criminal justice system have captured the public’s interest. One way this has been expressed is by the increased use of forensic science in fictional works, from its use in written crime fiction, e.g. the works of Sir Arthur Conan Doyle and his fictional detective Sherlock Holmes, to the television fictional representations of forensics in modern day dramas such as CSI. These fictional works have had both a positive and negative effect on the public’s perceptions of science and the criminal justice system. They have also contributed to people’s knowledge and understanding of science. The ways in which scientific information can be learned from fiction and its assimilation into a person’s general knowledge was discussed. The communication of science as a field of study has gained recognition as an important interface between scientists and the public. It recognises that communicating science is complex and many models of science communication have been proposed to incorporate this complexity. In the context of readers, it is acknowledged that readers will bring their own background to the table when encountering scientific information, including social, cultural and political. This will impact upon their reading experience and the extent of which they gain incidental knowledge from the text. Science communication occurs on many different levels, from the purely pedagogic to the popular, such as
literature. This thesis seeks to explore whether science can be communicated through crime fiction. It tests the hypotheses that it is important to readers of crime fiction that the science they encounter in novels is accurate, and that writers of crime fiction endeavor to ensure the science they include in their fiction is accurate.
Chapter Two: Methods

To examine the research questions in this thesis 1) Do readers of crime fiction place value on scientific accuracy? And 2) What attitudes do writers of crime fiction have about the accuracy of science in their fiction? a mixed method approach was used. There were three parts to the research. First was a case study of Ngaio Marsh to give a historical perspective on the questions, and to inform the methods and questions of the subsequent surveys. A historical perspective gave opportunity to explore if the attitudes, motivations and concerns of authors in the past reflected those of the modern-day author. The research then analysed two contemporary surveys to examine modern day attitudes towards the science communicated in crime fiction. The first survey gave an author’s or creator’s perspective, while the second gauged the beliefs and attitudes of the readers of crime fiction and represented the end user’s or recipient’s viewpoint.

2.1 Mixed methods research theory

The fundamental rationale behind mixed methods research is that we can often learn more about our research topic if we can combine the strengths of qualitative research with the strengths of quantitative research while compensating at the same time for the weaknesses of each method (Punch 2014, p303).

The research in this thesis used a mixed method framework to test the hypothesis that it is important to readers of crime fiction that the science they encounter in novels is accurate, and writers of crime fiction endeavor to ensure the science they include in their fiction is accurate. Quantitative research, including analysis using survey methods, brings the strength of being able to identify trends and relationships between variables in a large study population. Qualitative research provides a greater context, whether social or political. It uses smaller sample sizes and can gather
information at a greater depth in its participants. Qualitative research also enables flexibility in the selection of method to best study the target population (Punch 2014).

Mixed method enquiry found its beginnings in the mid-twentieth century, and arose from debate on the appropriateness and effectiveness of research methods between the social sciences and philosophy of science. The social sciences research methods were traditionally based on those of the natural sciences, and argued for the superiority of quantitative methods over the qualitative methods favoured by the science philosophers. The engagement became known as the “great qualitative-quantitative debate” of the 1960s, 1970s and 1980s (Greene 2007). Social science had used a positivist ideal modeled on the natural sciences – the “assumption that the social world exists independent of our knowledge of it (realism), a commitment to objective methods and to methodological sophistication, and the setting of questions of value outside the perimeter of scientific questions of fact, all in service of causal explanation as universal truth” (Greene 2007, p33). Social science then adopted a post-positivism approach, which followed positivist ideals, but incorporated the limitations of method when human observers were involved. This tended towards a quantitative tradition. Science philosophers, such as Wilhelm Dilthey took an interpretive stance, due to the differences in subjects researched by the natural sciences and social sciences. Interpretive knowledge used context, was subjective and included human values and emotions. It tended towards the qualitative tradition. The debate contested which stance and methodology was superior – quantitative, with controlled and standardised statistical parameters to represent populations; or qualitative, with in-depth, responsive and contextual representations of a small population or of individuals. The debate came to realise there was a place for both methods in social research – research that examined the social world (May 2011). Cronbach et al. stated, “merit lies not in form of inquiry but in relevance of information...[and] the evaluator will be wise not to declare allegiance to either a quantitative-scientific-summative methodology or a qualitative-naturalistic-descriptive methodology” (Cronbach et al. 1980).
The pre-existing acceptance of triangulation from both sides of the debate aided acceptance of a mixed methods approach. Triangulation was the recognition that taking measurements from more than one position would provide a more precise result (Greene 2007). The use of mixed methods offset the limitations and biases of each method of research and increased the validity of the research. Triangulation was a term first used specifically for research between or across methods by Webb, Campbell, Schwartz and Sechrest in 1966 (Johnson, Onwuegbuzie, and Turner 2007). Denzin gave the first insight on how to triangulate methods by identifying four types: data triangulation, which used a number of sources; investigator triangulation, which used a number of different researchers; theory triangulation, which used multiple theories and viewpoints to interpret study results; and methodological triangulation, which used more than one method to study a research question (Johnson, Onwuegbuzie, and Turner 2007).

This combining of the ideals of positivism and interpretivism in a mixed methods paradigm was a pragmatic approach (Figure 1). Pragmatism is a philosophy of science that integrates different perspectives and methods. It allowed for an “epistemological justification (i.e., via pragmatic epistemic values or standards) and logic (i.e., use the combination of methods and ideas that helps one frame, address, and provide tentative answers to one’s research question[s]) for mixing approaches and methods” (Johnson, Onwuegbuzie, and Turner 2007, p125).
Patton stated “methods, no less than knowledge, are dependent on context. No rigid rules can prescribe what data to gather to investigate a particular interest or problem. There is no recipe or formula in making method decisions” (Patton 2002, p12). Cronbach and Shapiro described study design as being as much art as science, and stated that good designs could be attained, but not perfect ones (Cronbach and Shapiro 1982). Combining different research methods can provide complementary insight into a subject that would not be possible with only one method. A case study allows an in depth analysis of one subject, whereas by contrast, a survey can gather a large amount of data from a large number of participants at a low cost (Plowright 2011).

Johnson et al. (2007) formulated a comprehensive definition of mixed methods research after reviewing the literature and arguments of leaders in the field. They defined mixed methods research as “practical synthesis based on qualitative and quantitative research” (Johnson, Onwuegbuzie, and Turner 2007, p129). They went on to describe mixed methods as a third methodological research paradigm, along with qualitative research and quantitative research. As such it acknowledged the value of both qualitative research and quantitative research in their own rights, but recognised the benefits of amalgamating the two to provide more

\footnote{Reproduced with permission of the author.}
informative analyses. Their definition described mixed methods research as a research paradigm by breaking it down into four components. According to this definition, mixed methods research had to:

1. Align with the philosophy of pragmatism.

2. Use the logics of both qualitative and quantitative research to enable research findings that were both useful and defensible.

3. Be dependent on the qualities and logic of both qualitative and quantitative research to address the research question, such as their data collection and analysis, viewpoints and the methods undertaken to draw a conclusion.

4. Take a broader view that incorporated the social contexts, including sociopolitical, resources and research needs.

These elements would result in more in-depth research findings and outcomes. Johnson et al. claimed the mixed methods research paradigm would generate research questions as well as provide a platform for being able to answer them. The definition of “paradigm,” as used by Johnson et al. was a “set of beliefs, values and assumptions that a community of researchers has in common regarding the nature and conduct of research” (Johnson, Onwuegbuzie, and Turner 2007, p129).

2.1.1 Case study methodology

Yin describes the classic case study as “an in-depth inquiry into a specific and complex phenomenon (the ‘case’), set within its real-world context” (Yin 2013, p321). He states that although case studies are used widely in social sciences research, there has been scant attention in the literature on methodological aspects (Yin 2012). When comparing case studies to other forms of data gathering and research, there is often a misconception that the different methods are arranged hierarchically, that initial exploratory phases were best suited to case studies, then surveys are undertaken for a descriptive phase, and experiments are the only strategy suited to explanatory or direct cause scenarios. Yin asserted that these different
strategies be treated as *pluralistic*, that each can be “exploratory, descriptive, or explanatory” (Yin 1994, p3). He stated each strategy had defined characteristics, but there are areas of overlap that could be used to advantage. He proposed three conditions that need to be considered in choosing the most appropriate research strategy “(a) the type of research question posed, (b) the extent of control an investigator has over actual behavioral events, and (c) the degree of focus on contemporary as opposed to historical events” (Yin 1994, p4). The case study was the research strategy that emerged as most appropriate when considering Yin’s conditions for the research question “can science be communicated through crime fiction?” and specifically the examination into the work and research processes of Ngaio Marsh. The question “can” is more explanatory as opposed to a research question that may ask “who,” “what,” or “where,” which are more exploratory. The research question did not require control over behavioural events, therefore did not require the environmental controls of an experiment. The focus of the rationale behind the research question was on both historical and modern day communication of science, therefore a case study was deemed a more useful method of investigation than a history or archival analysis (Yin 1994).

The characteristics of a case study could be divided into methodological types. Creswell identified eight categories:

- Natural setting, which incorporated on-site interactions with subjects.

- Researcher as key instrument, where the researcher was the observer, interviewer and examiner of information.

- Multiple sources of data, where the researcher collected data on a topic, individual or case from several sources such as documents, interviews, audio visual material and books. The data was reviewed, analysed and themes identified across all of the information sources.
• Inductive and deductive data analysis, where the researcher examined a database and worked back and forth until they established a set of themes.

• Participants meanings, which was participant focused rather than research question.

• Emergent design, which allowed the flexibility of not tightly prescribing the method so the process could alter with the emerging data.

• Reflexivity which took into account what the researcher brought to the study with respect to their personal background; and holistic account where a complex picture of the topic from many perspectives was undertaken (Creswell 2014).

The case study of Ngaio Marsh undertaken in this thesis came under the methodological type of multiple sources of data.

Interviews provide one of the most important sources of information for case studies (Yin 1994). Yin added the caveat that they should be noted as verbal reports as they are subject to bias, reliant on memory and the communication abilities of both the interviewer and the interviewee.

Patton outlined three methods of interviewing for qualitative data collection – the informal conversational interview, the general interview guide approach and the standardised open-ended interview (Patton 2002). A general interview guide approach was taken when interviewing people who knew Ngaio Marsh. Under this method an interview guide was used to ensure that all interviewees were asked the same base questions (Appendix 4). This method allowed for each individual to explore the questions within their knowledge, and to also direct the interview in accordance with the participant’s thoughts and recollections. It allowed for the respondent to have a greater flexibility on how to answer, and the ability for the interviewer to follow a thread or chain of thought that may provide a different insight or direction.
A search of the literature revealed few method papers giving examples of how to structure a written case study. Yin described research design as being a blueprint that addressed the essential problems of research, that included what question or questions were the basis of the study, what relevant data should be collected and how would that data be analysed (Yin 1994). Therefore, the structure of the written case study of Ngaio Marsh was adapted from the five components of research design outlined by Yin in *Case Study Research*, which broke the components of the case study into 1: the study questions; 2: the study propositions; 3: describing its unit of analysis; 4: the logic that links the data collected to the study propositions; and 5: the criteria for interpreting the findings (Yin 1994). In this instance, the unit of analysis was an individual crime fiction writer, Ngaio Marsh.

### 2.1.2 Survey methodology

Surveys are a technique for gathering a systematic set of data (De Vaus 1991). They involve collecting information from multiple individuals in a population on the same variables to form a mass of data for analysis. Creswell stated a survey design “provides a quantitative or numeric description of trends, attitudes, or opinions of a population by studying a sample of that population” (Creswell 2014, p12). The researcher could then analyse the data and draw inferences about that population. The data could be analysed at different levels of complexity depending on the research aims. The variables could be used to describe the sample population’s response to questions in simple proportions. These were status, or descriptive surveys. They were often used in market research, or politically to gauge opinion of a voting public (Punch 2014). Data could also be analysed to examine the relationship between variables in correlational surveys. They tested how variables changed in relation to each other, i.e. how they co-varied. When one variable explained the change in another, it was accounting for variance (Punch 2014). The analysis of the data generated by the two surveys undertaken for this thesis was both descriptive and correlational. Surveys were used to investigate the opinions of the readers and the writers of crime fiction,
and also to examine the relationships between the variables, such as response to previous questions, and demographic data.

2.1.3 Likert-type scales and collapsed data

Scales are a means of measuring responses to questions posed to participants in survey research and are often used in social sciences (Matell and Jacoby 1971). In this thesis, the survey participants were asked to respond to a statement by choosing one of five anchors on a Likert-type scale – agree strongly, agree, neutral, disagree, disagree strongly. The ratings participants give on a Likert-type scale provided ordinal data (Norman 2010).

The number of anchor points offered on a Likert-type scale is dependent on the kind of data researchers wish to analyse. A Likert-type scale with a larger number of anchor points provided two kinds of information – the intensity of response and the direction of response (Matell and Jacoby 1971). Dawis stated using more scale points was advantageous as the number could be compressed after the data was gathered, but you could not increase the scale points after the fact (Dawis 1987). The more scale points you had only increased the measure of intensity of response, it did not alter the direction.

Cronbach suggested people tended to have set tendencies in selecting the degree of a response on a scale, regardless of the direction of the response. These test taking habits of individuals were referred to as response sets, such as acquiescence – a tendency to agree; evasiveness – a tendency to be neutral or undecided; or a tendency to choose the extreme positions (Cronbach 1950, Peabody 1962). In the pilot surveys undertaken in this study, participants returned a high number of neutral responses. As a result, the statements were rewritten to encourage a directional response and reduce the amount of evasiveness. Collapsing the data into three categories indicated the directional component of the score – agree, neutral or disagree - but removed the intensity level. Experiments conducted by Jaboby and Matell found that the reliability and validity of
data on Likert-type scales was independent of the number of scale points (Jacoby and Matell 1971), and that collapsing data did not affect reliability or validity. In this study for analysis the data were compressed to agree, neutral and disagree to indicate direction of response.

2.1.4 Non-random sampling method

The populations targeted for both the reader and the writer surveys were very specific - writers of crime fiction, and readers of crime fiction. The purpose of targeting these particular groups was that crime fiction by its nature contained scientific content due to forensic investigation being undertaken in the course of solving the crime. This platform gave the ability to explore the research questions research questions 1) Do readers of crime fiction place value on scientific accuracy? And 2) What attitudes do writers of crime fiction have about the accuracy of science in their fiction? Due to this specificity, a non-probability sampling method was chosen (Plowright 2011). Snowball sampling was chosen as the most effective method of reaching the target population, a non-random method commonly used in social research. It is also called chain, referral, network or reputational sampling (Blaikie 2010).

A sampling procedure may be defined as snowball sampling when the researcher accesses informants through contact information that is provided by other informants. This process is, by necessity, repetitive: informants refer the researcher to other informants, who are contacted by the researcher and then refer her or him to yet other informants, and so on. Hence the evolving ‘snowball’ effect, captured in a metaphor that touches on the central quality of this sampling procedure: its accumulative (diachronic and dynamic) dimension. (Noy 2008, p330).

Original research using snowball sampling used it to identify and contact small at risk or stigmatised population sub-groups, e.g. HIV sufferers (Sadler et al. 2010), or hard to track populations e.g. backpacker tourists
(Noy 2008). It provided a method for researchers to reach specific populations where it would otherwise be difficult to identify and recruit participants.

2.1.5 Virtual snowball sampling

The advent of online survey platforms has increased the potential for researchers to reach a larger number of prospective respondents, and has also provided a cost effective means of collecting data. Traditional methods of surveying incurred design and development costs, the costs of printing and postage, or of face-to-face or telephone surveying. The online platforms’ templates allow researchers to develop their own surveys with ease, and delivery to email addresses or distribution via social networks voids the need for postage.

There are many advantages to online surveys. These were discussed by Baltar, and by Evans and Mathur, and included the ability to reach a global audience; utilising technology that allowed the respondent data to be instantly transformed into collated databases in a number of formats; the software would pick up duplicate responses from an individual; the ability to personalise the survey by having, for example, different language options; respondents answered the questions in the correct order; and the survey could be designed so respondents could easily advance to questions that extend from the previous response, or would automatically skip questions that did not apply (Baltar and Brunet 2012, Evans and Mathur 2005).

Baltar, and Evans and Mathur also discussed the potential problems of conducting online surveys. These included prospective participants regarding the email as spam; they created ‘volunteer’ samples, where only those who were interested enough to respond or proactive did so; online surveys were impersonal; as online surveys were self-administered there was no opportunity for respondents to seek clarification on a question; participants may have been concerned about privacy and how the data was used; and a low response rate. There could also be
considerable selection bias associated with online surveys due to accessibility to computers and internet, although some researchers said this was diminishing with time as home computers and reliable internet become the norm, and more households had access to this technology making web-based sampling more representative (Brickman Bhutta 2012).

The use of Facebook and other social networking sites (SNSs) for the distribution of surveys is becoming more common. The first social networking site launched in 1997 and was named SixDegree.com (Baltar and Brunet 2012). Many smaller communities emerged in the ensuing years, but social networking use boomed with the advent of MySpace and LinkedIn in 2003, and the Facebook in 2004.

“Facebook and other SNSs allow us to carry chain-referral methods into the age of the Internet, while also exploiting the strengths of web-based questionnaire” (Brickman Bhutta 2012, p60). One facet of the distribution of research surveys by snowball sampling via SNSs was the perception of trust. As the links or referrals came from ‘friends’ there was an increased level of confidence in them. Also, in some instances where a researcher had set up their profile information, respondents were able to access it and be more confident about the purpose of the research. This is one advantage of snowball sampling in general – it propagates trust and has “cultural competence” (Sadler et al. 2010, p370).
2.2 Case study of Ngaio Marsh

The case study consisted of two parts: a review of the bibliography, primary and secondary materials of Ngaio Marsh, and interviews with individuals who knew Ngaio Marsh. A detailed biography of Ngaio Marsh was constructed to provide context for the case study.

2.2.1 Case Study Propositions

The purpose of the study propositions was to identify the relevant information for the scope of the case study, and provide direction to the components to be examined in order to address the study questions. By having specific propositions a study would stay within feasible limits, and provide a framework of relevance for the researcher, therefore enabling them to avoid the temptation to include every piece of information encountered (Yin 1994).

The study propositions for this case study were:

Ngaio Marsh cared about ensuring accuracy in her novels.

Ngaio Marsh undertook thorough research for her novels.

Ngaio Marsh was aware of the potential flow-on effects of providing forensic science in her novels.

2.2.2 The logic that linked the data collected to the study propositions, and the criteria for interpreting the findings

Yin listed the logic that links the data collected to the study propositions, and the criteria for interpreting the findings, as two essential components of case study design (Yin 1994). He also stated that these two elements were often the least well developed. There was little methods literature
offering examples of case study design that addressed these elements. Therefore, for the purpose of the case study presented in this thesis, the logic linking the data collected to the study propositions and the criteria for interpreting it were as follows:

For each study proposition, the format that was followed was: 1: Introduction of the proposition. 2: Presentation of the evidence and examples. 3: Formation of a conclusion. The evidence and examples came from mixed sources, including primary and secondary materials, interviews with individuals who knew Ngaio Marsh, and from the works of Ngaio Marsh.

2.2.3 Review of the bibliography, primary and secondary materials of Ngaio Marsh

The bibliography of Ngaio Marsh includes thirty-two Detective Chief Inspector (DCI) Roderick Alleyn novels that were published over a forty-eight year period from 1934 - 1982, as well as collections of short stories, columns, plays and non-fiction publications (Appendix 1). Print versions of the DCI Roderick Alleyn novels were read in chronological order of publication, with a particular emphasis on identifying the forensic science and general science content. Instances of the use of standard police forensic science techniques were noted for each novel. (Appendix 2). Information was also recorded for each novel on the murder weapon, murderer, and any in-text commentary on Marsh’s attitudes towards science and crime fiction. Standard police forensic science techniques searched for included fingerprint identification, forensic photography, blood analysis, footprint identification, and forensic psychology. Reading and analysing the print novels in their entirety also enabled identification of indicators of Marsh’s attitudes towards this science and the potential flow-on effects of it embedded in the text. Incidences of in-text commentary between characters discussing the science used in the novels, the effects of crime fiction, or the potential for copycat crime were recorded. As there was only one researcher undertaking the reading and identifying indicators of Marsh’s attitudes towards science, there was
potential for researcher bias due to the assessments being made based on the researcher’s perceptions and experience. This was mitigated as much as possible by the researcher’s awareness of the issue, and by objective and systematic evaluating of the texts.

In addition to standard police forensic techniques, unusual or unique science used to enhance the plot was also identified when reading the novels. These uses of science were judged to be unusual if they would have required specialist knowledge or research. An example was the identification of an individual fish by its unique scale growth patterns in *Scales of Justice* (Marsh 1976b). The chosen examples of science were then examined to determine Marsh’s research methods and potential sources of information for that science.

Ngaio Marsh cited numerous book titles within the text of her novels, with her detective characters noting their presence in suspect’s libraries, or with secondary characters discussing the contents and themes of them. Specifically mentioned book titles were recorded, and an Internet search was undertaken to establish if they were real-world published titles or fictitious titles. A search for the published titles was then undertaken in Ngaio Marsh’s personal library at Marton Cottage, Christchurch, New Zealand.

The methods Marsh used to research the standard police forensic techniques and the unusual science were investigated through reading print resources, watching or listening to multimedia, and undertaking interviews with individuals and specialists with whom she may have had discussion. Methods used to investigate these sources included study of primary materials. These consisted of Marsh’s autobiography, *Black Beech and Honeydew*; television interviews, radio interviews and newspaper reporting. Secondary materials were searched for evidence of the communication of science, research methods undertaken by Marsh, individuals she may have consulted about specific scientific knowledge, and observations about her attitude to the science she included in her fiction. These secondary materials consisted of several biographies, books, documentaries, symposia proceedings and papers, newspaper and
magazine articles, and grey literature such as theses and non-academic articles (Appendix 3).

2.2.4 Interviews with individuals who knew Ngaio Marsh

Ngaio Marsh died in 1982, so the recollections of people interviewed for the study were from a period of time of at least thirty-four years ago. Interviews were undertaken as face-to-face interviews, telephone interviews, or as email correspondence according to the preferred contact method for the interviewee. The sample frame for interview participants for the case study of Ngaio Marsh was individuals who knew Ngaio Marsh personally, such as family, friends, associates, theatre colleagues, or individuals she consulted for scientific information. Potential interview participants who knew Ngaio Marsh personally were identified by recording the names of those who featured in the documentary Three New Zealanders – Ngaio Marsh (Clark 1977), and individuals who were mentioned in primary and secondary materials who were still living. Potential interview participants were also identified after discussion with officials from organisations associated with Ngaio Marsh such as the Ngaio Marsh House Trust and Friends of Ngaio Marsh Trust, and also from direct appeal to the audience during the delivery of the Ngaio Marsh Memorial Lecture, Christchurch, 2014. Contact details were searched for online, and requests for interview made by email. Personal interviews were undertaken with two individuals. Initial contact was made with a third individual, but due to availability a subsequent interview did not take place. Publicity of the research topic on National Radio during my regular monthly book review also resulted in being contacted by a participant who contributed information on technical aspects of Died in the Wool.

A general interview guide approach was taken when interviewing people who knew Ngaio Marsh (Patton 2002). Under this method an interview guide was used to ensure that all interviewees were asked the same base questions (Appendix 4). This method allowed for each individual to explore the questions within their knowledge, but to also direct the
interview in accordance with the participant’s thoughts and recollections. The interviews were audio recorded and transcribed by a professional transcriber. The transcription method used “smooth verbatim,” which included all words spoken, but removed word pauses, such as um, and ah. The information gathered from the interviews was not coded and treated quantitatively as the purpose of the interviews was to provide qualitative information for the case study of Ngaio Marsh. The information provided by participants was used to give personal insight and knowledge of Ngaio Marsh to be able to discuss her research methods and her attitude to the science she portrayed in her novels. Quotations used from the interviews in the case study were taken from the transcript, and therefore follow the smooth verbatim conventions. The interviewees were offered anonymity, but all were happy to have their comments attributed to them.
2.3 Survey Methodology

2.3.1 Survey development

The readers’ survey “Do you believe the science you read in crime fiction” was developed first (Appendix 5), followed by the writers’ survey “Writing science into crime fiction: Authors’ attitudes to forensic science in their work” (Appendix 6). The process of developing questions for the readers’ survey investigating reader attitudes towards the science they encountered in crime fiction led to asking the converse question - what were the attitudes of writers to the science they included in their crime fiction? Investigating writer attitudes would provide a comparison between reader expectation and writer obligation.

A search of the literature indicated no research had been undertaken to investigate reader responses to the science they encountered in print fiction, nor had author attitudes to including scientific material in their work been examined. The questions asked in the writer survey did not perfectly mirror the reader questions in all instances, but the underlying themes of the reader questions were reflected in many of the writers’ questions. The writers’ survey included additional questions that pertained to the writer experience and attitudes to copycat crime, and also the research methods used by writers to ensure the accuracy of the science incorporated into their work.

2.3.2 Pilot studies in the survey development process

The anonymous online writers’ survey and readers’ survey were developed using the online Survey Monkey platform (https://www.surveymonkey.com/). Survey Monkey provided a template structure for survey development, links for survey distribution, data collection platform, basic statistical analysis and downloadable formats of the data for use in external statistical software. The pilot writers’ survey contained nine statements for participants to respond to,
and the pilot readers’ survey contained nine statements. The statements were designed to provide reader or writer responses about their attitude to the science they encountered in crime fiction, the accuracy of that science, and the importance of that accuracy to them. For the majority of statements participants were offered a choice of five responses on a Likert-type scale: agree strongly, agree, neutral, disagree, disagree strongly. The order of this cascade was the same for every statement posed for the purposes of consistent data coding and analysis. The word “neutral” was chosen as the middle ground option instead of the cumbersome “neither agree nor disagree” or “undecided” as the target population were readers and writers of long fiction (crime fiction) who would have the required reading level to understand the implication. Each question also provided an open-ended text box for comments from which a qualitative analysis was planned. Demographic information was sought for age, gender, ethnicity, highest educational qualification and country of residence.

The pilot readers’ survey was sent out to a selected group of twelve New Zealand readers from varying backgrounds, including academics, bookstore employees, publishers, editors and self-identified book lovers. Of the twelve people invited to participate, ten completed the survey. Participants were also invited to provide feedback on the survey and four of them sent detailed and useful responses. Results from the pilot showed a high number of neutral responses to several of the questions. Feedback from participants and neutral responses were taken into account and the final survey developed. This was a longer survey and the statements designed to encourage a definitive response rather than a ‘neutral’ response.

The pilot writers’ survey was sent to a single New Zealand crime writer. The pilot survey was only sent to one crime writer as the number of New Zealand crime writers is small, and therefore sending the pilot survey to more crime writers would have reduced the potential number of participants in the final survey. The writer who completed the pilot survey was asked not to participate in the final survey as their prior knowledge of the survey and identification of the primary researcher
could lead to bias. The writer who completed the pilot survey provided detailed and useful feedback which was used to modify the way statements were posed, and increase the number of statements posed.

2.3.3 Open text boxes for participant comments

Participants were given the opportunity to comment on each statement they had rated on the Likert-type scale in open text boxes. This allowed opportunity for qualitative data to contextualise survey responses. Fossey stated that a strength of qualitative research is its ability to represent the participant’s perspective. The use of quotations to compare with the researcher’s description and interpretation of the data enabled scholars to evaluate the authenticity of the researcher’s claims (Fossey et al. 2002).

2.3.4 Author survey sampling frame

A sampling frame is defined as the list of all sampling units, or individuals in a population to be studied (Scheaffer et al. 2011). A sampling frame was established to define the population to be studied in this research. The sampling frame for the author survey “Writing Science into Crime Fiction: Author attitudes to forensic science in their work,” was all living writers of crime fiction internationally. In order to calculate the sample as a percentage of the sample frame, an attempt was made to determine the total number of contemporary crime writers internationally. Online searching revealed no central database of crime fiction writers. Searching using combinations of the keywords crime, writers, authors, numbers, revealed some lists of authors such as those on Wikipedia (http://www.wikipedia.com). These lists were small and incomplete, and the criteria for authors to appear on the list was that they had a Wikipedia author page. The Wikipedia ‘Crime writers’ list numbered 343 authors, ‘mystery writers’ 400, and thriller writers, 378 (access date 26 October 2015). The lists overlapped, with some authors included on more than one list. The lists also included deceased authors. Online book retailer Amazon (http://www.amazon.com) did not have the search
engine capability to list authors, and therefore the subset of crime fiction authors, nor did the online book index, Google Books (http://www.books.google.com), or the online retailer, Book Depository (http://www.bookdepository.com). Goodreads is an online readers’ and writers’ community that reviews and discusses books and authors (http://www.goodreads.com). Their Author Program listed 159524 authors as having enrolled across all genres. (access date 26 October 2015). They did not have the search engine capability to narrow the range by genre. Online public library catalogues searched did not have the functionality to provide a list of crime writers. Due to the lack of accurate data on the number of living crime fiction writers, we were not able to calculate the survey sample as a percentage of the sample frame.

2.3.5 Reader survey sampling frame

The sampling frame for the reader survey “Do you believe the science you read in crime fiction?” was all people who read crime fiction internationally. Searches online and of the literature could find no references to total number of readers of crime fiction in the world.

Goodreads claimed to have access to a large number of readers, with the quote on their home page “Gain access to a massive audience of more than 40 million book lovers.” This total was for all readers and was not broken down by genre. Independent survey data were available for some individual countries, e.g. the United States of America (USA) and Great Britain, which expressed crime fiction readers as a percentage of a survey sample. This could be extrapolated out by applying to total population statistics to give an approximation of crime fiction readers in those countries. Data were available on crime fiction books as a percentage of total print book sales for New Zealand (6.8% of volume), Australia (5.8%), USA (5.8%) and Great Britain (8.6%). It could also give an indication of numbers of crime fiction readers, but there was no data on numbers of crime fiction book purchases of individuals to correlate with total book sales to use as an

---

6 Purchased data, 2014 calendar year result. Nielsen BookScan.
indication of total number of crime fiction readers. With the lack of information of the total number of readers, the sampling frame could not be determined.

2.3.6 Participant recruitment for writers’ and readers’ surveys

The objective of this survey was to provide an indicator of views of writers to the science they provide in their crime fiction, with quantitative data, and also qualitative data in the form of open response boxes. Writers did not appear to have been surveyed before, thus this survey was viewed as an opportunity to answer the research question, and also to examine the potential for further research into writers of crime fiction.

The online writers’ survey was distributed to several email databases and a hyperlink was provided to take participants directly to the survey. The email databases targeted were The New Zealand Society of Authors, The Otago Southland Branch of the New Zealand Society of Authors, Sisters in Crime – Australian Branch, The Crime Writers Association (Australia); The Crime Writers Association (Britain); and the Friendfeed Crime Writers group. Specialist Crime Fiction Writer’s Agency Gregory and Company, London, also distributed the survey to its authors. Organisations and their URLs are provided in Appendix 7. When it became apparent that there was a small proportion of male respondents to the survey following the initial distribution, individual male crime writers were invited to participate in the survey. They were selected on the basis of availability of direct contact details from personal websites. The response rate from the male crime writers remained low.

The objective for the readers’ survey was to attract a minimum of 400 participants. This would enable the statistical analysis that followed to have a 95% confidence interval and 5% margin of error (Krejcie and Morgan 1970). The online reader’s survey was distributed via several databases based in New Zealand that provided hyperlinks directly to the survey. These included Beattie’s Book Blog; The Dunedin City Libraries Network; The University Book Shop, Dunedin; The New Zealand Society
of Authors, The Otago Southland branch of the New Zealand Society of Authors, The New Zealand Book Council; WEA (Workers Educational Association) Book Discussion Scheme, Women’s Book Shop, Auckland, Unity Books, Wellington, Readers groups, Crime Watch book blog; The University of Otago English Department, Zoology Department, School of Pharmacy, Centre for Science Communication; Victoria University English Department; Auckland University English Department; Quote Unquote; several New Zealand high school library databases; LIANZA (Library and Information Association of New Zealand); and SLANZA (School Library Association of New Zealand Aotearoa). Organisations and their URLs are provided in Appendix 8. The survey link was also distributed via Facebook and Twitter by those groups and individuals who had the facility to do so. These databases seeded a snowball or viral sampling process.

2.3.7 Data collection and analysis

The readers’ and writers’ surveys were constructed using the Survey Monkey platform (http://www.surveymonkey.com). The surveys were open for participation and data collection from 14 October 2013 to 3 November 2014.

The data were downloaded from Survey Monkey into Excel (Microsoft Excel, version 14.5.8, Microsoft Corp., Washington, USA) and then imported into the statistical data analysis programme STATA (version 11.2, Stata Corp., Texas, USA).

Participants were asked to indicate their country of residence in the demographic section. This question provided a text box for responses. The responses were then numerically coded into countries using the Statistics New Zealand Country four-numeric classification code (Statistics New Zealand 2014a). This data was then collapsed into the geographical regions, Oceania, the Americas, Europe, Asia and Africa.

Participants were asked to indicate their occupation in the demographic questions and were provided with a text box to record their answer.
Where a participant indicated more than one occupation, the first response indicated was used for the purposes of coding as it was deemed more likely to be their primary occupation if listed first. The responses were numerically coded into occupations using the Australian Bureau of Statistics and Statistics New Zealand ANZSCO Australian and New Zealand Standard Classification of Occupations. These were initially coded into individual occupations, and then the data was collapsed into the major occupational group categories (ANZSCO 2013).

Qualitative data analysis of the open text box responses for each question in the two surveys was undertaken using nVivo software (QSR International Pty Ltd, Melbourne, Australia. Version 11.1.1). The nVivo software was used in this instance to identify themes that recurred across the comments received from the individual statements for each survey. A ‘node’ or code was created for each new theme identified by the researcher whilst processing the survey statement comments in sequential order. Coding can be undertaken by a deductive method, where predetermined nodes are identified and the comment box content then coded accordingly, or by an inductive method that identifies nodes as the data is being processed, following the principles of grounded theory (Martin and Turner 1986). An inductive method was used for the author and readers’ surveys. This method was chosen as the nature of the survey questions changed across the course of the survey, and therefore an inductive method accommodated emergent themes of the differing statement topics (Thomas 2006). Saturation of themes emerging from the statements in both the writer and reader surveys did not occur until the final two or three statements. The qualitative thematic data sourced from the open text boxes was then used to support and clarify the quantitative data obtained from survey participants’ responses to the statements on the Likert-type scale.

2.3.8 Missing data protocol

The surveys were designed with an initial filter question for each respective survey of “do you read crime fiction?” and “do you write crime
fiction?” Participants who responded “no” to these questions were skipped to a final page thanking them for their time. These participants were counted in the overall participant numbers for the surveys as an indicator of overall response rate to the surveys.

The surveys were designed so that participants did not need to complete a question in order to be able to progress through the survey. Participants were able to skip questions they did not want to complete or did not feel able to complete. The numbers of responses for each question were recorded and percentages were reported based on the number of participants who answered each question.

2.4 Ethical approval for interviews of individuals who knew Ngaio Marsh

Ethical approval was sought and approved by the University of Otago Human Ethics Committee for the interviews conducted in the Ngaio Marsh case study. This included the methods and permissions for identification of participants. Consultation was also undertaken with the Ngai Tahu Research Consultation Committee, University of Otago, New Zealand.

2.5 Ethical approval for the author and reader surveys

Ethical approval was from the University of Otago Human Ethics Committee for both “Writing Science into Crime Fiction: Authors attitudes to forensic science in their work,” and “Do you Believe the Science You Read in Crime Fiction.” Consultation was also undertaken with the Ngai Tahu Research Consultation Committee, University of Otago, New Zealand.
3 Chapter Three: Results of the case study: Ngaio Marsh, New Zealand Crime Fiction novelist (1895-1982)

Yin describes a case study as an empirical enquiry that examines an occurrence within its real-life context (Yin 1994). The purpose of the case study of Ngaio Marsh was to provide context to the reasoning and lines of questioning undertaken in both the author and reader surveys. The choice of Ngaio Marsh for the case study also provided a New Zealand interest. The structure of this case study was adapted from the components of research design outlined by Yin: the study questions; the study propositions; describing its unit of analysis; the logic that links the data collected to the study propositions; and the criteria for interpreting the findings (Yin 1994). In this instance, the unit of analysis was an individual crime fiction writer, Ngaio Marsh. A biography of Ngaio Marsh is provided as section 3.2.

3.1 The Study Questions

The study questions addressed in the case study of Ngaio Marsh also incorporated the aim of this thesis, that is, to discuss the question “can science be communicated through crime fiction?” Therefore, the questions being examined in this case study were:

- How did Ngaio Marsh view the science she included in her crime fiction and its accuracy?
- How did she undertake her research to achieve accuracy?
- How did she express her concerns about the potential flow-on effects to the public of providing scientific information?
3.2 Biography of Ngaio Marsh

Edith Ngaio Marsh (1895 – 1982) was New Zealand’s most successful crime novelist. She had thirty-two crime fiction novels published in her Detective Inspector Roderick Alleyn series from 1935 to 1982, as well as short stories and works of non-fiction (Harding 2016). Her work was published internationally, and such was her popularity she was named as one of the four Queens of Crime Fiction in the Golden Age of crime fiction along with British writers Agatha Christie, Dorothy Sayers and Margery Allingham (Rahn 1995). The Golden Age of crime fiction was defined as the period of time between the First and the Second World War (Scaggs 2005). Marsh received many accolades for her writing, including being awarded an Edgar (also known as a Grand Master of the Mystery Writers of America), the first honorary doctorate awarded by The University of Canterbury, New Zealand, in 1962, an OBE in 1948, and she had the honour of being made a DBE, Dame Commander, Order of the British Empire in 1966 for her services to literature and theatre (Drayton 2008). New Zealand’s award for crime fiction is named in her honour – The Ngaio Marsh Award for Best Crime Novel.

Ngaio Marsh was born in Christchurch, New Zealand, on 23 April 1895 to Rose Elizabeth Seager and Henry Edmund Marsh. Henry Marsh had emigrated from London in 1888, and ultimately arrived in Christchurch to take up a position as a bank clerk for the Bank of New Zealand. He had attended Dulwich College as a boy, a grammar school founded by Edward Alleyn, hence the name Ngaio Marsh chose to endow upon her lead character (Lewis 1991). Rose and Henry Marsh were both involved in amateur theatrics, and met on the set of a production in Christchurch. As a child Marsh was exposed to many aspects of theatre life with her parents rehearsing lines in the house. One occasion lead to a life-long fear of poisons. Marsh relates the story in the television documentary on her life as part of the Three New Zealanders series (Clark 1977)(13’28”). She had the misfortune to overhear her parents rehearsing lines for Fools Paradise, a drama where a wife poisons her husband. She says it had a “rather tragic effect on me.” “I developed an absolute terror of poisons...to this day if I
introduce a poison I get quite a sort of frisson just writing the words, still.” She elaborates more on the incident in her autobiography *Black Beech and Honey Dew*.

I am sure my mother was right and that it was this highly-coloured drama that engendered the terror which obsessed me, in the validity of which I did not believe and which took so long to evaporate. To this day on the rare occasions I use poison in a detective story, I am visited by a ludicrous aftertaste of my childish horrors (Marsh 1981a, p13).

When Marsh was young her family moved into Marton Cottage, the family home built in the Cashmere Hills. Marton Cottage remained her home for the duration of her life and she died there aged 86 on 18 February 1982 (Harding 2007). The home is now preserved, virtually as she left it, as Ngaio Marsh House. It is open to the public for tours and is administered by the Ngaio Marsh Trust. It contains many valuable resources, including Marsh’s reference library.

Ngaio Marsh’s early education was provided by a private select dame school until the age of twelve. She was then educated by her mother and a governess, Ms Ffitch, until she later attended secondary school at St Margaret’s College, Christchurch. It was here that Marsh began to display her talent for writing and for theatre, winning awards for English and essay writing (Rahn 1995, The Press 1910, 1912). St Margaret’s also gave her a knowledge and love of Shakespeare (Lewis 1991).

Marsh also proved to be a talented painter. She attended the Canterbury College School of Art from 1915 to 1919. As well as exhibiting her work through the Canterbury Society of Arts, she also exhibited with ‘The Group,’ which brought her into a peer group of artists that included Olivia Spencer-Bower, Rata Lovell-Smith, Evelyn Page and Rita Angus (King and Hearnshaw 1996). Marsh’s artistic background is reflected in her writing in the character of Agatha Troy, an artist who later becomes Alleyn’s wife (Lewis 1991).
Theatre influenced Marsh’s life from an early age. Her diary entries record many trips to the theatre as a child (Lewis 1991). As a young woman Marsh toured New Zealand as an actress with the Alan Wilkie Shakespeare Company, and then with other repertory companies. She began to produce Shakespeare plays for the University of Canterbury drama group in 1943 (Marsh 1981a).

It was during time spent in London that Marsh wrote her first Detective Chief Inspector Roderick Alleyn novel. In 1928, Marsh travelled to England for a prolonged stay of almost five years with her friends, the Rhodes family. The family appears as The Lampreys, in her 1941 novel A Surfeit of Lampreys (Marsh 1981a). The Rhodes family introduced her to the social circles of London, which in later years led to a collaboration with gynaecologist Dr. Henry Jellett in writing the 1935 novel The Nursing Home Murder (Marsh 1983c). She and Nellie Rhodes opened a design store together, selling home goods in Knightsbridge called “Touch and Go” (Drayton 2008). At this time Marsh wrote a regular column for The Christchurch Press with her observations under the pseudonym the “New Canterbury Pilgrim.” Her crime writing career had its beginnings in 1931 when she began to write her first detective novel - A Man Lay Dead.

All day Sunday it rained and I read a detective novel from a little lending library in Bourne Street. I don’t remember the author now, but think perhaps it was Agatha Christie. I was not a heavy reader in the genre but I had, off and on, turned an idea for a crime story over in my mind. It had seemed to me a highly original idea (Marsh 1981a, p194).

Marsh had to return to New Zealand to look after her mother shortly after submitting the manuscript to agent Edmund Cork from London-based agency Hughes Massie. Cork also happened to be the agent of Agatha Christie (Lewis 1991). Marsh’s mother, Rose Seager Marsh died in Christchurch in November 1932. A Man Lay Dead was accepted for publication by Geoffrey Bles, and thus began a career that saw Marsh write Thirty-two Detective Chief Inspector Roderick Alleyn novels (Weinkauf and Burgess 1996). Her works were published around the
world, and such was her prestige that in 1949 Penguin Publishing and Collins produced the Marsh Millions, where 100 000 copies of ten of her novels were printed and released. This put her in the exclusive company of Agatha Christie, H.G. Wells, and George Bernard Shaw (Drayton 2008, Harding 2007, Sisterson 2009).

The majority of Marsh’s novels were set in England, with only four being set in New Zealand: those being *Vintage Murder* (1937); *Colour Scheme* (1943); *Died in the Wool* (1944); and *Photo Finish* (1980). Marsh was in New Zealand during the Second World War, hence it is likely the reason behind *Colour Scheme* and *Died in the Wool* being set in New Zealand (Rahn 1995). During this time Marsh drove an ambulance for the Red Cross, transporting returned wounded soldiers from their ships to hospital in Christchurch (Marsh 1981a). An interesting observation was that most of her New Zealand novels were set in places Marsh had painted (King and Hearnshaw 1996). Biographer Katherine Slate McDorman thought Marsh’s painterly eye contributed to her New Zealand novels containing some of her best descriptive writing. “The settings of Marsh’s English novels seem like ‘spare charcoal line drawings’ to McDorman in comparison to the ‘lush oils’ of her New Zealand work” (King and Hearnshaw 1996, p44). Some might think it curious that Marsh, a New Zealander, wrote her novels set in Britain. She was described as an anglophile. Harding asserts that:

Marsh had always been the archetypal Antipodean sojourner: the person who could never give absolutely final allegiance (cultural and spiritual) to either New Zealand or England. In all of this we may argue that Ngaio made the delightful discovery (even though it probably would not have been a conscious one) that she could readily exist in a state of social fluidity, with loyalties encompassing both hemispheres… (Harding 1996, p58).

This duality did not diminish her love of New Zealand. This is illustrated in her words in the short book *New Zealand* that she wrote as part of the British Commonwealth Picture series for Collins (Rahn 1995).
It is not easy for a New Zealander to write of New Zealand. He stands in danger of two pitfalls. Either he will think he speaks to his own people, and then he may fall to scolding, or he will think he speaks to outsiders, and then he may grow arrogant with that curious antipodean arrogance that is, in reality, a defence. (Marsh 1942, p7).

She felt a great affinity for England, instilled by her father. Although she had this affinity, travelling there for prolonged periods gave her a sense of difference and perhaps a sense of not belonging quite in either camp. This is illustrated by a further statement on the colonial origins of many New Zealanders – “The white people of this country bear the imprint of their origin. They are still rather like their English great-grand parents, but they are not nearly so like their English contemporaries” (Marsh 1942, p7). This sense of difference is reflected in her fiction, in the character of Roberta Gray in A Surfeit of Lampreys. Roberta was a young New Zealand woman feeling similar, yet out of place amongst a very English family. Harding refers to Roberta Gray as an alter-ego character for Marsh (Harding 2007).

Marsh’s great love was the stage and Shakespeare, with whom she shared her birthdate, April 23 (Marsh 1981a). In New Zealand in particular, she was more acclaimed as a producer and director of Shakespearian theatre than she was for her crime fiction (Acheson 1985). She had a long association with the Canterbury University College Drama Society directing many Shakespearian plays, including Hamlet, Julius Caesar, Othello, and King Lear (Hooper 1996, The Evening Post 1945b). Her knowledge of theatre and stagecraft found its way into her fiction, with a number of her DCI Alleyn novels being set within a theatre. She included Shakespearian quotes in many of her novels and some of her novels’ characters’ names were plays on the names of dramatic characters (Weinkauf and Burgess 1996). Literary critique of the day recognised the theatrical qualities intertwined into her characters and plots, a feature that was a point of difference from her contemporaries (Rahn 1995, Drayton 2008).
Ngaio Marsh was well known for her reticence about discussing many elements of her life. She was an intensely private person and protected her privacy by destroying personal correspondence and asking her friends to also destroy letters she had written to them (Drayton 2008). Consequently there is little primary written material that illustrates her attitude towards the science she portrayed in her crime fiction, other than her autobiography. She did not readily discuss her fiction writing with her friends. Close friend and actress Annette Facer commented, when interviewed, that in hindsight she regretted not talking more with Marsh about her crime writing (Facer 2016).

Ngaio Marsh continued writing crime fiction until the end of her life. The typed manuscript for her last novel, Light Thickens, was received by her publisher on the day of her death, 18 February 1982 (Drayton 2008). This novel, set on the stage of a production of Macbeth, seemed a fitting end to an extraordinary career.

3.3 Examination of the study propositions

3.3.1 Ngaio Marsh viewed the science in her novels and its accuracy as being important.

Ngaio Marsh undertook substantial research to ensure the scientific detail she included in her novels was accurate. The biographers of Marsh commented on the extent of her research. Joanne Drayton described Marsh as researching every aspect of her novels, from police procedure to the manner of the deaths. She stated that in addition to consulting with friends from medical backgrounds, she made extensive use of her personal reference library, and also her local library. “Ngaio never wrote anything unless she investigated it before Alleyn” (Drayton 2008, p65).

The thorough research Ngaio Marsh undertook for her crime fiction illustrates how important accuracy was to her. This drive for excellence and getting the technical details correct extended beyond her fiction, and was also evident in other creative outlets in her life, her drama
productions, and painting (Hooper 1996, King and Hearnshaw 1996). When discussing her achievements in theatre, Elric Hooper, actor, and later artistic director of the Court Theatre, Christchurch, stated “…she presented Christchurch and later the rest of New Zealand with a series of theatre events whose standards of presentation, theatrical nous and, above all, intellectual rigor, set new standards of play production in the country” (Hooper 1996, p7). Marsh’s standards of accuracy in theatre also extended to ensuring correct nomenclature, arguing at a discussion to establish a name for the New Zealand Drama Council, that no amateur society was ‘repertory’ as described by the Oxford Dictionary (The Evening Post 1945a).

Marsh elaborated on how important research was to her in an article for The Evening Post, and is attributed with having said “I like to study thoroughly the topics with which I deal…and indeed it is essential to do so, for detective stories demand exact knowledge. But works on forensic medicine and the like are very dear, and I have had to make a library of my own” (The Evening Post 1938, p19). In another 1940 newspaper report Marsh voiced her fears of having inaccuracies pointed out in her work. In this example, she was addressing a social evening for members of PEN (an international writer’s organisation), and other writers’ associations. In her address, she is reported as commenting on the readership for her work, and stated “the brutes who read detective stories are chiefly the men who find you out if in the wrong, doctors, detectives and lawyers” (The Evening Post 1940, p16).

Bruce Harding, a postgraduate researcher, interviewed Marsh extensively in 1978 for his Masters thesis in English at Canterbury University (Drayton 2008). Harding recorded many interviews with Marsh, talking with her about her life and her writing. He describes her thorough research of police procedure, which included traveling with Scotland Yard detectives to crime scenes, and also with the New York Police Department, when visiting in 1960 (Drayton 2008). “She didn’t want to make what she called ‘bloomers’” (Harding 2015). Marsh also had numerous titles on Scotland Yard and police procedure in her personal library.
One of the ways that Marsh demonstrated her determination for accuracy in her novels was to have characters cite real books in the text. She used this technique in several novels, and a number of the texts she cited were held in her personal research library at Marton Cottage. By citing books that existed in the real world, rather than inventing fictional titles, Marsh was signaling to her readers that she was in fact well read, and took her research seriously. She had expressed her frustration and disappointment at the prevailing New Zealand attitude that her crime fiction writing was lightweight and not real literature in her autobiography *Black Beech and Honeydew.*

Whenever I return to New Zealand I am always asked to write articles saying what I think about it now and even, on exceptional occasions what I think about William Shakespeare, but seldom what I think about crime stories… Intellectual New Zealand friends tactfully avoid all mention of my published work and if they like me, do so, I cannot but feel, in spite of it. (Marsh 1981a, p227).

By including these real-world titles in her writing, and the gritty social issues they exposed and discussed, she was making a statement that her works were well researched, and addressed serious social issues of the day, and this validated their place as literature with a purpose more than pure entertainment. It is interesting that Marsh’s insecurities led to her feeling the need to include this overt statement of authenticity.

An example of Ngaio Marsh making reference to volumes she held in her personal research library comes in her 1945 novel, *Died in the Wool.*

A few days before his wife was killed, he had written: ‘I have been reading a book called ‘Famous Trials.’ I used to think such creatures as Crippen must be monsters, unbalanced and quite without the habit of endurance by which custom inoculates the normal man against intolerance, but am now of a different opinion (Marsh 1963, p246).
The text she refers to is the 1929 volume, *Lord Darling and his Famous Trials*, by Evelyn Graham (Graham 1929). This book is present in her personal library at Marton Cottage. Lord Charles John Darling was a high court judge in Britain. One of the most famous trials Lord Darling judged was that of the appeal of Harvey Hawley Crippen (Walker-Smith 1938). Crippen was convicted and hanged for the 1910 murder of his wife, Cora Crippen, whom he poisoned with hyoscine, and then dismembered, burying her torso in the basement of their Hilldrop Crescent, London, home (Old Bailey Online 1910). This was a sensational high profile murder, with international media coverage of the trans-Atlantic boat chase and arrest of Crippen and his lover, Ethyl Le Neve, and then subsequent trial and execution of Crippen. It was reported in many New Zealand newspapers, including Marsh’s hometown newspaper, *The Christchurch Press*. The Crippen case was influential on Marsh and she referred to Crippen in several of her novels. The case was one of the inspirations for her choosing hyoscine as the murder weapon in *The Nursing Home Murder* (Symon et al. 2015).

Another example of an in-text citation occurs in Marsh’s 1958 novel, *Singing in the Shrouds*. The characters discuss the non-fiction book *The Show of Violence* by Frederick Wertham (Laube 1949). Wertham was an American psychiatrist and the book outlines a number of cases he reviews. In *Singing in the Shrouds* Marsh used the forensic technique of psychological profiling in the hunt for a serial killer or ‘psychopathic murderer.’

“…What was that book you recommended? By an American psychiatrist, I think you said.”

Mr Merryman muttered huffily: “I don’t recollect.”

Marsh makes a further commentary on why people were fascinated by reading about true crimes, and by extension crime fiction, in the conversation between a number of characters and Detective Chief Inspector Alleyn.

“...Why, by the way, is everybody so fascinated by crimes of violence?” He looked at Father Jourdain. “What do you think, Sir?”

Father Jourdain hesitated and Mr Merryman cut in.

“I am persuaded,” he said, “that people read about murder as an alternative to committing it.”

“A safety valve?” Alleyn suggested.

“A conversion. The so-called anti-social urge is fed into a socially acceptable channel: thus we commit crimes of violence at a safe remove..” (Marsh 1976c, p68).

The novel Singing in the Shrouds also cites characters reading The Trial of the Wainwrights, The Trial of Neil Cream, and The Ballad of Reading Gaol, by Oscar Wilde (Marsh 1976c). Both The Show of Violence and The Trial of the Wainwrights are titles present in Ngaio Marsh’s personal library at Marton Cottage.

3.3.2 Ngaio Marsh undertook thorough research for her novels

Ngaio Marsh was a strong proponent of research, using the resources in her own reference library at Marton Cottage as well as those at her local library (Drayton 2008). She valued accuracy in her work and like all writers, did not want the embarrassment of having errors pointed out by readers. This insistence on accuracy was something she observed in the work of Henry Jellett, with whom she collaborated in her third novel, The Nursing Home Murder. Jellett had a reputation as a difficult man who would have nothing short of perfection. This was demonstrated in the entry Marsh made in her autobiography referring to the stage version of
the novel, *Exit Sir Derek*. “Naturally, my collaborator – I was allowed to call him Papa Jellett – was a stickler for correct techniques.” The demand for accuracy and authenticity in the production was highlighted by the presence of a number of doctors in the audience, peers of Jellett.

The performance, though warmly applauded, was not without its pretty disastrous moments. The assistant surgeon dropped a glove. He then picked it up. All the doctors laughed very heartily. Papa Jellett ground his teeth (Marsh 1981a, p200).

Jellett’s influence at an early stage in her career, in 1935 and with her third novel, helped to set the standards of accuracy by which she conducted her research thereafter.

Marsh established a comprehensive library of reference material at Marton Cottage. These volumes ranged from the creative work of her peers – Christie, Allingham, Sayers; to the dramatic works of Shakespeare and analysis of the theatre, to more medico-legal texts. Titles included Lord Alderstone’s court cases, books on Scotland Yard, Medical Jurisprudence, and famous court trials. She had medical texts and books on psychology, as well as crime and criminology. A number of her novels involved narcotics and the drug trade. Accordingly her library contained non-fiction titles such as *Merchants of Heroin* by Alvin Moscow, and *Undercover Agent: Narcotics* by Derek Agnew. Her personal research library was large and diverse.

Marsh made good use of friends and acquaintances when needing specific information. In her tenth novel, *A Surfeit of Lampreys*, Lord Wutherwood (Uncle Gabriel) is attacked in the elevator with a skewer through the eye orbit. The eyeball itself is not punctured, but the skewer passes through into the victim’s brain. He does not die immediately, but shortly thereafter. The specific anatomical knowledge needed for this murder was provided by family friend and renowned surgeon Sir Hugh Acland (Lewis 1991, O’Sullivan 2011)). Marsh was a regular visitor to the Acland home at Peel Forest, near Christchurch, and she is buried at The Church of the Holy Innocents at Peel Forest, near to the Acland family plots.
Marsh’s ease of asking for specialist advice extended beyond research for her novels. Her younger cousin, John Dacres-Mannings, reported that Marsh assisted considerably in his upbringing, including his sex education.

The only child of her parents, unmarried, and without the benefit of any love affair of which I am aware, she was under some handicap. Nevertheless, she set about it with a will. Undaunted, she scoured material from any gynaecologist she knew (Rahn 1995, p29).

Dacres-Mannings also commented in the same article that when visiting Marsh in London, they socialised with senior Scotland Yard staff at events. Excursions also included trips to The Old Bailey (Dacres-Mannings 1995).

It is likely Marsh drew upon her contacts at the University of Canterbury for the purposes of research in her novels. She was director of the University of Canterbury Drama Society, directing many plays, and therefore Marsh had an association with staff and students across many departments. During the course of interviewing individuals who knew Ngaio Marsh, they were asked if they were aware of Ngaio Marsh talking with actors who were involved with sciences in the University of Canterbury about research for her novels. Both Harding and Carter indicated they did not witness specific examples, but believed Marsh would have sought information from staff and students, and that there were members of the Drama Society who were involved in engineering, chemistry and physics, and also in law (Carter 2016, Harding 2015). Annette Facer also stated she could not recall any instances of Marsh talking about her crime fiction during rehearsals, but felt she would have asked individuals if she needed information (Facer 2016).

There are a number of her novels that required specific knowledge about scientific principles. The first to include a large amount of scientific content was her 1935 novel The Nursing Home Murder, the only novel she wrote in collaboration. Henry Jellett was Marsh’s gynaecologist, and he along with Sir Hugh Acland performed several operations on Marsh
when she “spent three months in hospital undergoing a series of minor operations and a final snorter of a major one” (Marsh 1981a, p199). It was during her time of convalescence that she began to work on the novel. It is not surprising that Marsh made use of Jellett’s clinical knowledge to enhance her first hand experiences of anaesthetic. It may seem unusual for such a doctor/ patient relationship to form, but Jellett was known to Marsh prior to this as part of the ‘Lamprey group,’ the broader group of friends associated with the Rhodes family (Marsh 1981a). He was also a friend of her father and used to visit Marton Cottage to have dinner and play darts and lexicon with Marsh’s father and friends (Drayton 2008, Marsh 1981a).

*The Nursing Home Murder* uses the anaesthetic drug hyoscine as a murder weapon in the setting of an operating theatre. (In that era private hospitals were referred to as nursing homes.) It gives very specific information as to the doses of hyoscine under normal therapeutic conditions, as well as those required for a fatal dose. The doses quoted in the novel are true to those quoted in the pharmacopoeia of the day (Martindale et al. 1932). Other standard treatments are also cited including ether, camphor, and anti-gas gangrene medication. The novel also portrays an accurate picture of operating theatre procedure and conditions, including the screening of the patient that allows the murderer – the anaesthetist – to access a syringe containing the fatal dose of hyoscine from its hidden place in the anaesthetic apparatus and administer it.

The extent of Marsh’s research, and the fine detail she included in her work, is illustrated by an experiment she undertook while writing her 1955 novel, *Scales of Justice*. Actress and close friend Annette Facer related how Marsh wanted to have her characters gauge the speed of the river, currents and eddies, so she and Marsh went to a local creek with its footbridge and threw sticks into the river, counting time and distance to indicate the flow rate (Facer 2016). This technique was then utilised in the novel by her characters Detective Chief Inspector Alleyn and Detective Inspector Fox (Marsh 1976b).
Marsh researched to get information in her novels correct, although on occasion errors were made. Bill Carter was an actor, stage manager and set builder for Marsh at the Canterbury University College Drama Society and is involved in the wool industry. In discussing Marsh’s 1945 novel *Died in the Wool* (Marsh 1963), Carter pointed out a few inaccuracies in the wool sale processes and wool classing. He also pointed out the physical constraints of fitting a body in a wool press and bale (Carter 2013). Marsh would have gained knowledge of sheep stations from her visits to Mt Peel, the home of her friends the Acland family (Marsh 1981a), and also the sheep station of her friend Phyllis (Carter 2013). Carter suspected *Died in the Wool* may have had editorial amendments made on elements of the wool trade by Marsh’s British publishers after submission as British terminology was used in some instances that were not in use in New Zealand (Carter 2013).

Ngaio Marsh undertook thorough research for all aspects of her novels, scientific, procedural and social. This attitude to ensuring accuracy was there at the outset of her writing career, as evidenced by Detective Chief Inspector Roderick Alleyn’s comment in Marsh’s second novel, the 1935 *Enter a Murderer*.

> The head and shoulders are covered in dust. It was while he was still hanging. It was swept off the top gallery. Analysis will prove it. We’ve got to come over all scientific, Fox (Marsh 1964, p168).

An innate drive for excellence and the influence of pivotal advisors early in her writing, such as Henry Jellett, is evidence that Marsh had high standards of accuracy and authenticity in her works throughout her career.

### 3.3.3 Ngaio Marsh was aware of the potential flow-on effects of providing forensic science in her novels

Ngaio Marsh was concerned by the potential consequences of readers gaining knowledge that could be used for criminal ends, whether this be
learning to evade detection by the police, or by committing copycat crime. She demonstrated her personal apprehension in her novels in the form of having her characters discuss copycat crime and criminals being inspired by fiction. These in-text discussions occurred in several of her earlier novels, but it is interesting to note these asides did not continue in her later work. This may have been due to her coming to terms with and acceptance of the possibility of copycat crime being based on her work, or Marsh may have realised the chances of this happening were very slim and her conscience adjusted accordingly. Keyword searches of search engines and newspaper archives have not revealed any traceable examples of copycat crime committed as a result of Marsh’s fiction. Search engines used were Google.com and Google Scholar, Yahoo.com, Ask.com and Bing.com. Keywords searched were Ngaio Marsh, novel, book, literature, copycat, crime, imitator, copier, mimic, hyoscine, thallium, and cyanide.

*The Nursing Home Murder* (1935) contained the most definitive examples of characters discussing copycat crime (Marsh 1983c). In *The Nursing Home Murder*, the British Home Secretary dies shortly after being operated on for acute appendicitis. Marsh uses the device of a play within a play where whilst in theatre, operating on the Home Secretary, the characters in the novel discuss a show on at The Palladium that mirrors their situation.

“There’s a one-act play. Anteroom to a theatre in a private hospital. Famous surgeon has to operate on a man who ruined him and seduced his wife. Problem – does he stick a knife into the patient?...” (Marsh 1983c, p29).

The conversation between the surgical team continues later -

“How did the play end?” he asked suddenly.

“What? Oh. Back to the conversation we first thought of. It ended in doubt. You were left to wonder if the patient died under anesthetic, or if the surgeon did him in…” (Marsh 1983c, p31).
Further into the murder investigation, Marsh has Detective Chief Inspector Alleyn discuss the play at The Palladium with his colleagues, and they raise the potential for it having inspired a copycat crime

“Curious coincidence, that little play, didn’t you think?” asked Alleyn.

“Very rum,” agreed Nigel. “When did you hear about it?”

“Thoms told me that he and Phillips discussed it before the operation. Thoms seemed so anxious not to talk about it I thought it might be worth seeing. I can’t help wondering if he meant to convey precisely that suggestion.”

“Had Sir John seen it?” inquired Angela.

“No. Thoms told him about it.”

“I say,” said Nigel. “Do you think that could have given Phillips the big idea?” (Marsh 1983c, p115).

*The Nursing Home Murder* was Marsh’s third novel, and the only novel she wrote in collaboration with another writer – gynaecologist Sir Henry Jellett. This reference to the “big idea” illustrates a self-awareness from Marsh, and the insecurities of an early career novelist. Sir Henry Jellett provided the scientific expertise for the novel with his medical and surgical experience. They may have discussed the potential for copycat crime and the references to it in text conveyed the anxieties of both parties.

Another example of Marsh making a direct reference to criminals learning from fiction appears in her 1939 novel *Overture to Death*,

“It’s like one of these affairs in books,” said Bailey disgustedly. “Someone trying to think up a new way to murder. Silly, I call it.”

“What do you say, Roper?” said Alleyn.
“To my way of thinking, sir,” said Sergeant Roper, “these thrillers are ruining our criminal classes.”

Dr Tempett gave a shout of laughter. Roper turned scarlet and stared doggedly at the wall.

“What d’you mean by that, my lad?” asked Fox, who as on his knees, staring into the piano.

Thompson, grinning to himself, touched off his flashlight.

“What I mean to say, Mr Fox,” said Roper. “It puts ideas in their foolish heads. And the talkies, too. Especially young chaps. They get round the place talking down their noses and making believe they’re gangsters. Look at this affair! I bet the chap who did this got the idea of it out of print.” (Marsh 1989, p112).

The advent in particular of talking movies, first produced in 1926, had led to criticism of the effects of movies on society. Crime movies such as *The Public Enemy* (1931), starring James Cagney, were criticised for glamorising gangster culture, and there was much public debate as to whether movies caused crime (Vaughn 2005).

Marsh’s concerns about the flow-on effects of crime in her fiction extended beyond the potential for copycat crime. She also used her fiction to make statements on other larger criminal justice system issues of the time, including the death penalty. She reminded her readership that perpetrators of murder were tried, and if found guilty faced the death penalty. The following quote from her 1949 novel *Swing, Brother, Swing* alludes to her stance on the issue of capital punishment.

“I disagree entirely and emphatically with capital punishment,” Lord Pastern said, puffing out his cheeks at the group of police officials. “I shall therefore keep my knowledge to myself. Let ‘em muddle on. Murder’s a matter
for the psychiatrist, not the hangman...” (Marsh 1981b, p119).

By including such references to the death penalty, Marsh may have been also illustrating her own tacit feelings of uncertainty and guilt at committing murder, even if on paper. This was a theme she carried through a number of her novels, and indicative of her interest in the subject, a title she held in her library at Marton Cottage was *Capital Punishment as a Deterrent: and the Alternative* by Gerald Gardiner Q.C.

The criminal justice system and its treatment of the mentally diminished or mentally ill was discussed by Marsh in her 1957 novel, *Off With His Head*. Marsh makes reference to The McNaughton Rules pertaining to the use of insanity as a defence (Fenwick 1993). The characters Detective Chief Inspector Alleyn and Dr Otterly talk of The McNaughton Rules in relation to the case of Ernie Anderson, an epileptic, suffering petit mal attacks.

“I may as well tell you,” he said, “that I disapprove strongly and vehemently of the McNaughton Rules and would never voluntarily bring anybody who was a mentally borderline case under their control.”

“And you look upon Ernie Anderson as such a case.”

“I do. He’s an epileptic. Petit mal...if I thought Ernie Anderson stood any chance of being hanged for the murder of his father, I wouldn’t utter a syllable that might lead to his arrest.”

“What would you do?”

“Bully a couple of brother-medicos into certifying him and have him put away.”

Alleyn said: “Why don’t you chaps get together and make a solid medical front against the McNaughton Rules?” (Marsh 1959, p114)
The McNaugton Rules came into effect in 1843 and put in place a legal framework for insanity as a defence in court. Rules one and two pertained to the testing of knowledge of right and wrong for those suffering mental illness, rule three related to the use of expert witnesses, and rule four related to judges using existing law (Dalby 2006). Her reference to the McNaughton Rules would have required research into law and medical jurisprudence. It also highlighted Marsh’s use of her fictional works to make social commentary.

Self-awareness of the potential for copycat crime, the flow-on effects of crime, such as capital punishment, and use of statutory rules demonstrated Marshes critical thinking and interest in greater society. Underlying the seemingly light façade of crime fiction, Marsh discussed some complex and timely issues. An example of this is eugenics and hereditary insanity, underlying themes that occur in The Nursing Home Murder. The 1935 novel involved an individual who strove to keep humanity free from those who had a genetic predisposition to insanity by murdering them. The novel was written in a period of history when Adolf Hitler and Nazi Germany’s eugenic agenda was developing (Searle 1979).

Marsh also indulged in her sense of humour, and expressed self-mockery of the detective novel and novelist. An example is this exchange between Alleyn and journalist Nigel Bathgate in The Nursing Home Murder.

“Do you read crime fiction?”

“I dote on it. It’s such a relief to escape from one’s work into an entirely different atmosphere.”

“It’s not as bad as that,” Nigel protested.

“Perhaps not quite as bad as that. Any faithful account of police investigations, even in the most spectacular homicide case, would be abysmally dull. I should have thought you’d seen enough of the game to realise that. The files are a plethora of drab details, most of them entirely irrelevant. Your crime novelist gets all over that by writing grandly
about routine work and then selecting the essentials. Quite rightly. He’d be the world’s worst bore if he did otherwise.” (Marsh 1983c, p112).

Marsh’s characters, across a number of novels, discuss how detective fiction filters out the mundane elements of police investigation to avoid boring the reader with that detail. By doing this Marsh is acknowledging that she is being as procedurally accurate as possible, but exercising licence in creating a plausible investigative environment in a work of fiction.

“It’s only – I know nothing about such things, of course, nothing. But I do read some of Edward’s thrillers, and it always seems to me that in the stories they make everything rather more elaborate than it would be in real life.”

“This is not a discussion on the dubious realism of detective fiction, Agnes.” (Marsh 1983a, p209).

Perhaps an indication that early in her career Marsh came to realise that providing accuracy was essential, but making allowances for entertainment was acceptable, is this quote from her 1940 novel Death at the Bar.

“I believe the word is routine,’ said Cubitt. ‘You see I know my detective fiction.”

“Routine it is,” said Alleyn. “And you’re perfectly correct. Routine is the very fibre of police investigation. Your novelist too has now passed the halcyon days when he swots up police manuals. He knows routine is deadly dull and hopelessly poor material for a thriller; so, like a wise pot boiler, he compromises. He heads one chapter ‘Routine,’ dismisses six weeks of drudgery in as many phrases, cuts the cackle and gets to the ‘osses. I wish to the Lord we could follow his lead.” (Marsh 1983b, p141).
3.4 The forensic science used in the novels of Ngaio Marsh

The 32 DCI Roderick Alleyn novels by Ngaio Marsh were written over a 48-year period. The novels were read in chronological order and forensic science techniques used in each novel was noted, in addition to the murder weapon and other specialised science of note (Appendix 2). The purpose was to observe if Marsh incorporated advancements in forensic science into her works over that period of time.

In general, Marsh used a basic set of forensic science techniques, and did not go into detail describing these techniques to the reader. When referring to photographic recording of the scene and fingerprinting, she often did so in the context of the police officers assigned to those techniques – her flash and dabs men, Sergeants Thompson and Bailey. They undertook standard procedures for photographing the scenes and fingerprinting of surfaces. There were two occasions where a more complex method of fingerprinting was used. In Death in Ecstasy (1940), the text specifically mentions the use of silver nitrate solution to develop fingerprints on the pages of a book (Marsh 1968). And in Death at the Bar (1940) Inspector Fox and DCI Alleyn use the fumes from an iodine solution to develop potential fingerprints on a document (Marsh 1983b).

Other regularly featured forensic techniques in the novels of Ngaio Marsh were chemical analysis and blood or tissue analysis, footprint analysis and the taking of casts, the comparison of type from type writers, ballistic evidence from gun barrels and projectiles, and fabric and fibre comparison. These were not described in detail, although on occasion Marsh would name a specific scientific test, for example the Marsh Berzelius test, used in the detection of arsenic in The Final Curtain (1947) (Marsh 1965).

In her 1958 novel Singing in the Shrouds Marsh used elements of forensic psychology (Marsh 1976c). As detailed in section 3.3.1, Marsh’s interest in the field was reflected in several of the characters reading non-fiction
books on psychology and criminal trials. In the novel Marsh uses elements of psychological profiling, with Alleyn noting the murderer had a ten day interval between each crime, and also their use of specific flowers to adorn the victims.

One instance where Marsh mentioned a forensic technique that had experienced an advancement in technology was in her 1966 novel Death at the Dolphin. In this work, an expert in the forensic examination of documents stated a number of tests could be undertaken to determine their authenticity, including infrared spectography (Marsh 1976a). Advances in electronics during and after World War II lead to increases in the stability and therefore application of infrared spectroscopy. It became used as a key analytical method in laboratories in the 1950s (Derrick, Stulik, and Landry 1999).

The pattern that emerged from recording Marsh’s use of forensic science was that she tended to use standard techniques of the day, and relied particularly on the use of photography and fingerprinting. Apart from a few examples, there is little indication that she actively sought to include the latest techniques or advancements in forensic science over the 50 year period in which she was writing. The methods she did use were accurate for the time.

### 3.5 Conclusion

The study propositions for the case study of Ngaio Marsh stated Marsh cared about ensuring accuracy in her novels, undertook thorough research for them, and was aware of the potential flow-on effects of providing forensic science in her novels. The evidence presented in the case study demonstrated Marsh placed high value on portraying accurate science in her crime fiction novels. It showed she undertook extensive research to ensure her procedural and scientific information was correct. Examples of Marsh accessing and amassing books on scientific, medical, legal and criminal related topics, and also talking to specialists in the field to ensure her information was up to date and accurate have been found.
She demonstrated her awareness of the potential flow-on effects of providing forensic detail by having her characters discuss copycat crime, and criminals learning how to avoid detection after reading crime fiction, in the body of the text. She also flagged her commitment to providing accurate information by citing real world books in her fiction.
Chapter Four: Results of the Author Survey – Writing science into crime fiction: author attitudes to forensic science in their work

The second research element of this thesis was the survey of authors to examine their attitudes towards the science they included in their fiction. The survey gave a creator perspective to the question can science be communicated through crime fiction. The survey questions followed two lines of enquiry; the author’s attitude to the accuracy of the science they included in their fiction, and the author’s concerns about the potential flow-on effects of providing accurate scientific information.

4.1 Survey response rate and calculation of sample size

The online anonymous author survey “Writing science into crime fiction: author attitudes to forensic science in their work” attracted forty-four respondents. This number of respondents exceeded the stated objective of ten participants as outlined in the methods chapter. This was partly due to a high response rate from members of a women’s crime writer organisation that shared the link to the online survey to its subscribers. Of the total survey respondents, 95% wrote crime fiction. This proportion of crime fiction writers was expected as the databases targeted were of groups supporting crime writers, and the introductory information sent in the survey request also indicated this was intended for writers of crime fiction. Participants who responded to the first question ‘do you write crime fiction?’ with ‘no’ were advanced directly to the end of the survey and thanked for their interest. The number of participants responding to each statement in the survey differed, as it was possible for respondents to miss individual questions and advance to the next. This process was used to
encourage respondents to complete the survey, rather than opt out if they encountered a difficult question. In the author survey, individual question responses varied from 36 to 43 (82%-98%).

The series of survey questions offered statements to which participants were asked to indicate their level of agreement or disagreement on a five-point Likert-type scale, with the options of agree strongly, agree, neutral, disagree, disagree strongly. Open text boxes were also offered for each statement to allow text comments from respondents. In the analysis of the survey results, the five anchor points of the Likert-type scale were collapsed into three categories. “Agree strongly” and “agree” were merged into “agree” or “positive,” “neutral” remained as “neutral,” and “disagree strongly” and “disagree” were merged into “disagree” or “negative.” This approach was to investigate the direction of response from participants as discussed in Chapter 2: Methods. Correlation analysis was undertaken using the Spearman’s correlation co-efficient ($p$) on the five-point data, and results were considered significant when $p<0.05$.

Open text box comments for each statement were coded using nVivo software (version 11.1.1, QSR International Pty. Ltd. Melbourne, Australia), and themes identified (Appendix 9). In the descriptive text for the statement analysis, the word ‘theme’ refers to the themes identified through coding the open text box responses using nVivo software.
4.2 Participant demographics

Demographic information was requested from participants at the end of the survey. This included gender, age, education, and country of residence.

The participants in the writer survey were 92% female and 8% male ($n=37$).

The majority of authors were aged between 40 and 69 years, with decade bands within this age span being of similar size (Figure 2). There were no respondents in the age bands 10-19 and 20-29 years.

![Figure 2: Age of author survey respondents ($n = 37$)](chart)

The respondents to the author survey were well educated with 84% having a tertiary qualification, and 51% having a postgraduate qualification (Figure 3). Sadler argued individuals with a tertiary education were more likely to participate in research as they realised the value of research and were more likely to respond to invitations to participate (Sadler et al. 2010). The demographic information on education collected in the author survey supported these findings.
Country of residence data reflected a high response rate from Australia (70%). As mentioned in section 4.1, a large spike in responses was observed immediately after the Australian organisation Sisters in Crime shared the survey link. Of the remainder, 22% of respondents resided in the United Kingdom, 8% in New Zealand, and there was one participant from the USA (Figure 4).

For the purposes of statistical analysis, this sample was non-randomised, and due to the large skewing mentioned in the demographic results
above, may not be a representative sample of crime writers. The quantitative data from survey results presented below has been contextualised, with qualitative information derived from the open text boxes provided with each question. This analysis includes thematic trends observed using nVivo software, and also quotes from participants’ responses. The themes identified are listed in Appendix 9. This provides some insight into the basis of the authors’ selections on the Likert-type scale, particularly for questions which generated a high proportion of neutral responses.

4.3 Author responses to survey questions and statements

The results for each individual statement are presented in the order in which they appeared for the participants of the survey, and the subheading for each result is the statement presented to participants. For each statement, the Likert-type scale responses are presented as a percentage, and they are contextualised using the nVivo thematic responses gathered from those participants who made comments in the open text boxes. The nVivo software does not give a specific numerical output, so themes are described subjectively as being predominant or strong. Whereas the Likert-type scale results are expressed as percentages, actual numbers of respondents who made comments are cited when discussing the themes, and the relative strength of the themes are divided according to those who had made a positive, neutral or negative response to the Likert–type scale. Illustrative quotes from open text box comments are also given as examples of the opinions expressed by participants in the free text sections of the survey.
4.3.1 What genre or genres of crime fiction do you write?

The question “What genre or genres of crime fiction do you write?” provided an open text box for responses. These responses were then coded into the major categories: thriller; police procedural; historical; children/young adult (children/YA); and amateur detective (Figure 5). The general/other category encompassed those responses that indicated the authors wrote across a number of genres, those who had written crime fiction or similar, and genres that did not easily fit into the major categories. In future surveys, it would be advantageous to provide participants a list of genres from which to make a selection as some authors were not sure how to attribute their genre, which meant the coding was then subject to interpretation by the researcher.

Figure 5: Question 2: What genre or genres of crime fiction do you write? (n = 41)
4.3.2 Do you include the use of forensic science in your novels?

Only 15% of respondents always used forensic science in their crime fiction novels, whereas 76% of respondents indicated they sometimes used it, and 9% indicated they never used forensic science (Figure 6). Nineteen respondents made comments in the open text boxes. Themes emerging in the open text boxes from those who responded ‘sometimes’ indicated some touched on forensic science but not in detail, for example “I use references to it rather than detailed information.” Another emergent theme from the group who responded “sometimes” was their usage of forensic science depended on the context of the story. One respondent stated “It depends on the case and the nature of the crime.” One writer who never used forensic science in their work stated the specific genre they wrote dictated the level of forensic science they could use, “My characters are amateurs and so they have no access to it.” Of those who always used forensic science, some indicated they ensured it was accurate, with one author stating they undertook a diploma in forensic medical science to assist their writing.

Figure 6: Question 3: Do you include the use of forensic science in your crime novels? (n = 41).
4.3.3 Readers expect crime fiction novels to contain forensic science

There were an equal number of positive and neutral responses to this statement, and 11% of authors responded negatively (Figure 7). Nineteen respondents made comments in the open text boxes, with 8 having responded positively to the statement, 10 neutrally and 1 negatively.

![Bar chart showing percentages of responses: Agree, Neutral, Disagree](image)

**Figure 7: Question 4: Readers expect crime fiction novels to contain forensic science \( n = 36 \).**

The major theme expressed in the open text box responses for positive, neutral and negative responders was the level of expectation was situational and depended on the genre and the focus of the story, e.g. from a positive responder, “It depends on the key focus and the protagonists of the book.” Some also observed that certain authors were expected to use forensic science in their works, e.g. from a neutral responder, “I think it depends on what they read. If they pick up a Kathy Reichs or Patricia Cornwell novel, then they will definitely expect forensic science. If an Ian Rankin, Kerry Green or Peter Temple novel, not so much” Patricia Cornwell and Kathy Reichs are writers who have an occupational background in medical and
forensic sciences and whose novels always integrate science into the story. One writer summarised by saying, “There is such a range of crime fiction now - from historical cosy mystery to slasher serial killer. I think it depends on the sub genre, on the author’s 'brand' and the readership.”

4.3.4 Readers take crime fiction that contains forensic science more seriously

Neutral responses were predominant for this statement, with 35% of authors agreeing, 46% neutral and 19% disagreeing (Figure 8). Of the 12 respondents who made open text box comments, 8 had responded neutrally to the statement.

![Bar Graph](image)

**Figure 8: Question 5: Readers take crime fiction that contains forensic science more seriously (n = 37).**

The predominant theme from the neutral responders was that whether or not readers took crime fiction containing forensic science more seriously depended on the context of the story, and also that accurate science did
not necessarily add credibility if the plot was unbelievable. Accuracy of scientific content was deemed important. “If the science is inaccurate, the author/book loses all credibility. So, yes and no depending on how right the author gets the information. Also, too much science can ruin a good story. Balance is crucial between information, action, characterisation...” Context of the story was also a theme for positive responders, with one stating “Depends on the sub genre. Readers who like cozy mysteries don’t seem quite as in need of that.” A negative responder who commented in the open text box stated, “A book can have forensic science in it and be implausible to the point where readers don’t take it seriously at all.”

4.3.5 The advent of forensic TV programmes such as CSI has increased the pressure on writers to include forensic science in their novels

Sixty percent of authors agreed with this statement, compared with 24% who remained neutral and 16% who disagreed (Figure 9). The open text box drew comments from 14 writers with 7 comments from positive responders, 4 from neutral responders and 3 from negative responders.

Figure 9: Question 6: The advent of forensic TV programmes such as CSI has increased the pressure on writers to include forensic science in their novels (n 37).
The predominant theme from positive responders was that CSI type programmes added pressure. One stated “Somewhat agree. Although the intelligent reader and TV watcher understands much of what is portrayed on TV is factually incorrect, particularly with people crossing over roles, the quick turnaround on toxicology and other results, often that cost is not prohibitive to an array of tests. But access to CSI type shows has also somewhat educated us in the importance of forensics in solving crimes and the methods used.” Neutral responders indicated that readers were being educated by CSI type programmes, therefore authors did not need to be so descriptive of forensic technique in their works, saying the audience’s forensic knowledge had expanded to the point where they understood the techniques and terminology. One stated, “This might have been true a few years ago but I think the appetite for these scenes has declined of late. At a panel at CrimeFest this last weekend, a group of bestselling crime writers agreed that they tend to cut these scenes out now, because readers ‘know’ what goes on from TV shows and don’t really need or want to read it on the page.”

The main theme from negative responders was that it depended on story. As one stated, “Not for me, I have not experienced any pressure from my publisher to up the FS\textsuperscript{7} ante. And I’d be hoping that realistic and truthful TV series such as The Killing and Broadchurch will switch the focus back to the human element.”

\textsuperscript{7} FS = forensic science
4.3.6 Readers believe the forensic science they read in crime fiction is true and accurate

The majority of authors agreed with this statement with 76% agreeing, and 13% disagreeing (Figure 10). Of the 17 writers who made open text box comments, 11 had responded positively to the statement, 4 neutrally and 2 negatively. The predominant theme that emerged from positive responders was readers are knowledgeable, and therefore accuracy was important. One author stated “Most probably will trust what they read, unless the material contains glaring mistakes. As said above, if the reader begins to mistrust some of the information, all will be in doubt.” Likewise, neutral responders indicated readers believed the science if it seemed plausible, with one stating, “I think if a crime fiction novel realistically describes the element of forensic science, it is likely to be believed as true.” One of the negative responders who made text box comments disagreed with the statement, indicating “I’d be very surprised if this was the case.”

Figure 10: Question 7: Readers believe the forensic science they read in crime fiction is true and accurate (n = 37).
4.3.7 Readers believe the accuracy of science written in a novel more than the accuracy of science they see in a TV programme such as CSI

For this statement 46% of writers gave neutral responses, 43% agreed and 11% disagreed (Figure 11). Of the 14 writers who commented in the open text boxes, 7 had responded positively to the statement, 5 were neutral and 2 responded negatively. A theme that emerged from positive responders was that the turnaround time frame for television had an impact on the ability to correctly research scientific information portrayed in them. One writer stated “Perhaps it’s just that as both a reader and writer, I understand the length of time it takes to write and edit a good book and the degree of research that may be involved. You can imagine the pressure on script writers is very high to pump out storylines very quickly, even at the detriment of good research and accurate information.” This theme was also reflected in comments made by neutral responders, with one stating “we have no way of knowing. That said, some readers *may* be more sceptical of DNA results coming back within the one CSI shift (due to the demands of TV script writing!), whereas in a book the author generally has more flexibility to represent the science with more attention to reality.”

Figure 11: Question 8: Readers believe the accuracy of science written in a novel more than the accuracy of science they see in a TV programme such as CSI ($n = 37$).
4.3.8 I like to thoroughly research the forensic science I use in my novels

This statement drew a strong positive response where 86% of writers agreed, whereas only 16% gave a neutral response and 8% disagreed (Figure 12). Text box responses were given by 14 writers, with 11 having given a positive response to the statement, 1 neutral, and 2 gave negative responses. The predominant theme among the positive responders was that they researched for accuracy. As one respondent stated “I try hard not to make errors. If I don’t know, I find out. If I can’t be sure I’m right, at least I make sure I’m not wrong.” Neutral responders indicated the genre they wrote affected their research priorities, with one stating “I do a minimum of research, but my stories are FAN FICTION, and the implied readers are fans focusing on relationships, NOT implied readers of literary/commercial crime fiction.” The negative responder stated forensic science was not a factor in their work.

![Figure 12: Question 9: I like to thoroughly research the forensic science I use in my novels (n = 37).](image-url)
4.3.9 I always ensure the science I include in my fiction is correct

This statement also drew a strong positive response where 92% of writers were in agreement and only 5% disagreed (Figure 13). Fourteen writers made comments in the open text box, 11 had responded positively to the statement, 1 neutrally and 2 negatively. The predominant theme among positive responders was that they researched for accuracy. A number of writers indicated they consulted experts in the field to ensure the accuracy of their scientific content. One commented “If not you break faith with your readers.” A comment that summarised the points raised by several positive writers, including the theme “it is fiction” was “Crime fiction writing is not science. It is fiction writing first - the telling of a tale - and usually contains some science. Some of what we write will be entirely factual, some we make up, some we stretch. I would hate to make mistakes in my novels but must still allow my imagination ample space.” The neutral and negative responders similarly allowed for fictional license, with one stating “Again, sometimes the facts need to be skewed to fit the story. For example, the speed of getting DNA results in fiction compared to in real life.”

Figure 13: Question 10: I always ensure the science I include in my fiction is correct ($n = 37$).
4.3.10 I am happy to have slightly incorrect scientific information if it advances the story

For this statement the majority of responses were negative with 65% of the authors disagreeing, 16% neutral and 19% agreeing (Figure 14). Thirteen writers made text box comments, with 3 having given positive responses to the statement, 4 neutral and 6 negative responses. Of those that agreed with the statement, the main theme expressed was it is fiction. One writer agreed with the statement in principle, but had not included inaccurate science in their work. They stated “I haven’t done this yet, but I wouldn’t rule it out. I write fiction, after all. And what good is poetic license if you don’t make use of it!” Thematically, text box comments from negative responders indicated any inaccurate information would depend upon the context of the story. One negative responder stated “No - I don’t like to play with scientific facts - the only time would be if the evidence was being based on possible unproven scientific evidence, and/or where the investigators misinterpret such evidence.” Half of the neutral responders indicated they would compress the time frames in their fiction, with one stating “I have not had this problem. For me, the problem may occur around time frames and availability of elements of forensic science. While I prefer to use ‘real life’ as the model, I might consider shifting these to advance a story line. Eg. Results becoming available earlier or later than they may in real life.”

Figure 14: Question 11: I am happy to have slightly incorrect scientific information if it advances the story (n = 37).
4.3.11  I feel an ethical obligation to ensure the forensic science included in my novels is correct

There was a strong positive response to this statement with 84% of the responding authors agreeing with the statement, whereas only 5% disagreed (Figure 15). Fewer writers made comments in the open text boxes on this question than with other questions (10), with 8 having responded positively to the statement and 2 neutrally. The emerging theme from writers who responded positively was that they researched to be accurate with the science they included. As one writer succinctly put it, “I feel an ethical obligation to make it all as truthful as possible - emotionally, socially, and procedurally but all in service of telling a truthful story.” The neutral responders referred to the fact that they wrote fiction.

Figure 15: Question 12: I feel an ethical obligation to ensure the forensic science included in my novels is correct (n = 37).
4.3.12 I worry that a reader will point out a factual error in my work

There were strong positive responses to the statement with 67% of authors agreeing and only 5% disagreeing (Figure 16). Only 8 writers made comments in the open text box, with 3 having responded positively to the statement, and 5 negatively. The emergent theme from those who chose to comment was they did not worry about reader opinion. Comments varied from authors who did not worry about it as some people will always find something to complain about, so they avoided using too much science so they could not get it wrong. “I don’t worry about this. Provided I haven’t made a catastrophic mistake, I like it the prospect of having someone read my books so closely and bother to contact me to point out any error(s).”

![Bar chart](chart.png)

**Figure 16: Question 13: I worry that a reader will point out a factual error in my work (n = 37).**
4.3.13 I am concerned about the potential for copycat crime as a result of my fiction writing

Only 14% of authors indicated they were concerned about the potential for copycat crime, 24% responded neutrally and 62% disagreed (Figure 17). Of the 12 writers who made comments in the open text boxes, 3 had responded positively, 4 neutrally and 5 negatively. The theme that emerged from the positive and negative responders was that their fiction was based on crime that had already occurred. As one negative respondent stated, “I cannot think of a single incident where that has been the case. Usually it’s the other way round – novels are inspired by real life crimes.”

Likewise, a positive responder was concerned about copycat crime, but commented that fiction was inspired by crime, “Yes, but my books are believable and topical simply because most of the crimes depicted have been committed already.” Two of the 4 neutral respondents commented they did not glamorise crime, as one stated, “This does not concern me greatly. I focus on the impact of the crime rather than the details of its commission, and I do not use the criminal’s point of view. The criminal does not become sympathetic or heroic.” One negative respondent mentioned the crime fiction readership demographic, “The bias of crime readership is towards middle-aged women. The bias of violent criminals is emphatically not. Besides which, people intelligent enough to enjoy my books are usually intelligent enough to avoid ruining their own and other people’s lives.”

Figure 17: Question 15: I am concerned about the potential for copycat crime as a result of my fiction writing (n = 37).
4.3.14 I have purposefully withheld scientific information in my novels due to my concern for potential copycat crime occurring

The majority of authors (86%) had not withheld scientific information for fear of copycat crime being committed, and only 14% indicated they had (Figure 18). Open text box comments were made by 10 respondents, with 9 of those comments coming from negative respondents. The majority of the respondent comments reiterated their disagreeing with the statement, and 2 included an observation that if the author could find something out, so could a reader independently. One author who responded “no” made the comment, “I have not withheld information. I have occasionally not fully described something- I acknowledge that this is a thin line.” The single comment from a positive responder, affirmed their response, “Yes, I have altered story-lines for fear that it might give someone an idea ...”

Figure 18: Question 16: I have purposefully withheld scientific information in my novels due to my concern for potential copycat crime occurring (n = 37).

4.3.15 My work has had copycat crime occur where the perpetrators used methods or inspiration from my writing

No authors reported having had copycat crime occur as a result of their work (Question 17).
4.3.16 I am concerned that perpetrators will learn how to avoid leaving behind evidence as a result of reading my fiction

Responses to this statement were predominantly negative (58%) with only 14% of authors were in agreement with the statement and 28% gave a neutral response (Figure 19). Open text boxes comments were made by nine writers, with one having responded positively to the statement, three neutrally and five gave negative responses.

![Bar chart showing the distribution of responses to the statement.]

**Figure 19: Question 18: I am concerned that perpetrators will learn how to avoid leaving behind evidence as a result of reading my crime fiction (n = 36).**

The major theme from negative respondents was that information was available everywhere. As one stated, “*Information is so readily available on the Internet that if someone was planning a crime, I believe that would be the place they looked for ‘inspiration’, not a book shelf.*” One neutral responder made the point that perpetrators should not look to fiction to learn how to avoid leaving behind forensic evidence as “*After all, my murderers are always caught!*”
4.3.17 I have purposefully withheld scientific information in my novels due to my concern for perpetrators learning how to avoid leaving behind forensic evidence

Only 5% of writers were in agreement with this statement, with 79% disagreeing and 16% neutral (Figure 20). Eleven writers made comments in the open text boxes, with 5 having made a neutral response to the statement, and 6 a negative response. The tone of many writers’ comments was dismissive in the open text boxes, for example, one writer commented “That’s a bit precious don’t you think?” Many comments echoed the previous question – that information was available readily on the internet and also from visual media. As one author put it, “Perpetrators need only turn on CSI to learn stuff like that. Ironically, police still find fingerprints at crime scenes so forensic knowledge becoming public knowledge doesn’t necessarily mean crooks get any smarter.”

Figure 20: Question 19: I have purposefully withheld scientific information in my novels due to my concern for perpetrators learning how to avoid leaving behind forensic evidence \((n = 37)\).
4.4 Correlation analysis

Correlation coefficients were calculated between each of the survey questions using STATA 11.2. software. The correlation test used to analyse statistically significant relationships between the responses to the author survey was the Spearman Correlation (rho). Motulsky recommended the use of the Spearman statistic to quantify the relationship between two variables under the following conditions: the data was a rank, and the data came from a non-Gaussian (non-normal) distribution (Motulsky 2010). These conditions were met by the author survey. Similarly, the University of California, Los Angeles (UCLA) STATA guide stated a Spearman correlation was used when one or both of the variables being tested were ordinal, such as the points on a Likert-type scale, and were not assumed to have a normal distribution (UCLA. 2016).

Correlation coefficients and significance levels were tested between each question (variable) that required a response on the five-point Likert-type scale (Table 2). There were 21 pairs of questions with significant positive correlation coefficients and two pairs with negative correlation coefficients (p<0.05). The statement “I am happy to have slightly incorrect scientific information if it advances the story” was the only statement that produced a significant negative correlation with any of the other statements. This was for “I always ensure the science I include in my fiction is correct,” and “I feel an ethical obligation to ensure the science included in my novels is correct.”
### Table 2: Author survey questions Spearman’s correlation statistics

<table>
<thead>
<tr>
<th></th>
<th>q4</th>
<th>q5</th>
<th>q6</th>
<th>q7</th>
<th>q8</th>
<th>q9</th>
<th>q10</th>
<th>q11</th>
<th>q12</th>
<th>q13</th>
<th>q15</th>
<th>q18</th>
<th>q19</th>
</tr>
</thead>
<tbody>
<tr>
<td>q4</td>
<td>1.0000</td>
<td>0.3956</td>
<td>0.4026</td>
<td>0.2196</td>
<td>0.1836</td>
<td>0.2190</td>
<td>0.1836</td>
<td>0.2763</td>
<td>0.0963</td>
<td>0.2246</td>
<td>0.0963</td>
<td>0.1723</td>
<td>0.3151</td>
</tr>
<tr>
<td>q5</td>
<td>0.3956</td>
<td>1.0000</td>
<td>0.3586</td>
<td>0.2292</td>
<td>0.2867</td>
<td>0.1589</td>
<td>0.2867</td>
<td>0.4609</td>
<td>0.4609</td>
<td>0.1099</td>
<td>0.1411</td>
<td>0.1629</td>
<td>0.3355</td>
</tr>
<tr>
<td>q6</td>
<td>0.4026</td>
<td>0.3586</td>
<td>1.0000</td>
<td>0.4460</td>
<td>0.3165</td>
<td>0.1490</td>
<td>0.3165</td>
<td>0.2509</td>
<td>0.2216</td>
<td>0.1516</td>
<td>0.2986</td>
<td>0.2012</td>
<td>0.1874</td>
</tr>
<tr>
<td>q7</td>
<td>0.2196</td>
<td>0.2292</td>
<td>0.4460</td>
<td>1.0000</td>
<td>0.5277</td>
<td>0.1782</td>
<td>0.2509</td>
<td>0.2509</td>
<td>0.5189</td>
<td>0.1820</td>
<td>0.2012</td>
<td>0.2852</td>
<td>0.1877</td>
</tr>
<tr>
<td>q8</td>
<td>0.1836</td>
<td>0.2867</td>
<td>0.3165</td>
<td>0.5277</td>
<td>1.0000</td>
<td>0.3526</td>
<td>0.5277</td>
<td>0.4684</td>
<td>0.5189</td>
<td>0.4502</td>
<td>0.5189</td>
<td>0.3526</td>
<td>0.5189</td>
</tr>
<tr>
<td>q9</td>
<td>0.2190</td>
<td>0.1589</td>
<td>0.1490</td>
<td>0.1782</td>
<td>0.3526</td>
<td>1.0000</td>
<td>0.1490</td>
<td>0.4815</td>
<td>0.4502</td>
<td>0.2196</td>
<td>0.4815</td>
<td>0.3526</td>
<td>0.1490</td>
</tr>
<tr>
<td>q10</td>
<td>0.1836</td>
<td>0.2867</td>
<td>0.3165</td>
<td>0.5277</td>
<td>0.3526</td>
<td>0.1782</td>
<td>1.0000</td>
<td>0.2509</td>
<td>0.5189</td>
<td>0.1820</td>
<td>0.3526</td>
<td>0.1782</td>
<td>0.5189</td>
</tr>
<tr>
<td>q11</td>
<td>0.2190</td>
<td>0.1589</td>
<td>0.1490</td>
<td>0.1782</td>
<td>0.3526</td>
<td>0.1490</td>
<td>0.5189</td>
<td>1.0000</td>
<td>0.2509</td>
<td>0.1820</td>
<td>0.3526</td>
<td>0.1490</td>
<td>0.5189</td>
</tr>
<tr>
<td>q12</td>
<td>0.1836</td>
<td>0.2867</td>
<td>0.3165</td>
<td>0.5277</td>
<td>0.3526</td>
<td>0.1782</td>
<td>0.5277</td>
<td>0.4815</td>
<td>1.0000</td>
<td>0.2509</td>
<td>0.3526</td>
<td>0.1782</td>
<td>0.5277</td>
</tr>
<tr>
<td>q13</td>
<td>0.2190</td>
<td>0.1589</td>
<td>0.1490</td>
<td>0.1782</td>
<td>0.3526</td>
<td>0.1490</td>
<td>0.5277</td>
<td>0.4815</td>
<td>0.5189</td>
<td>1.0000</td>
<td>0.3526</td>
<td>0.1782</td>
<td>0.5277</td>
</tr>
<tr>
<td>q14</td>
<td>0.1836</td>
<td>0.2867</td>
<td>0.3165</td>
<td>0.5277</td>
<td>0.3526</td>
<td>0.1782</td>
<td>0.5277</td>
<td>0.4815</td>
<td>0.5189</td>
<td>0.3526</td>
<td>1.0000</td>
<td>0.3526</td>
<td>0.1782</td>
</tr>
<tr>
<td>q15</td>
<td>0.2190</td>
<td>0.1589</td>
<td>0.1490</td>
<td>0.1782</td>
<td>0.3526</td>
<td>0.1490</td>
<td>0.5277</td>
<td>0.4815</td>
<td>0.5189</td>
<td>0.3526</td>
<td>0.1782</td>
<td>1.0000</td>
<td>0.3526</td>
</tr>
<tr>
<td>q16</td>
<td>0.1836</td>
<td>0.2867</td>
<td>0.3165</td>
<td>0.5277</td>
<td>0.3526</td>
<td>0.1782</td>
<td>0.5277</td>
<td>0.4815</td>
<td>0.5189</td>
<td>0.3526</td>
<td>0.1782</td>
<td>0.5277</td>
<td>1.0000</td>
</tr>
<tr>
<td>q17</td>
<td>0.2190</td>
<td>0.1589</td>
<td>0.1490</td>
<td>0.1782</td>
<td>0.3526</td>
<td>0.1490</td>
<td>0.5277</td>
<td>0.4815</td>
<td>0.5189</td>
<td>0.3526</td>
<td>0.1782</td>
<td>0.5277</td>
<td>0.4815</td>
</tr>
<tr>
<td>q18</td>
<td>0.1836</td>
<td>0.2867</td>
<td>0.3165</td>
<td>0.5277</td>
<td>0.3526</td>
<td>0.1782</td>
<td>0.5277</td>
<td>0.4815</td>
<td>0.5189</td>
<td>0.3526</td>
<td>0.1782</td>
<td>0.5277</td>
<td>0.4815</td>
</tr>
<tr>
<td>q19</td>
<td>0.2190</td>
<td>0.1589</td>
<td>0.1490</td>
<td>0.1782</td>
<td>0.3526</td>
<td>0.1490</td>
<td>0.5277</td>
<td>0.4815</td>
<td>0.5189</td>
<td>0.3526</td>
<td>0.1782</td>
<td>0.5277</td>
<td>0.4815</td>
</tr>
</tbody>
</table>

Key:
- rho: Number of obs.
- Sig.: level

- Signs of significance:
  - < 0.0001
  - < 0.001
  - < 0.01
  - < 0.1
  - 0.01
  - 0.05
  - 0.1
  - 0.5
  - 1.0
Table 3: Significant correlations between the Author Survey questions (p<0.05)

<table>
<thead>
<tr>
<th>Question</th>
<th>Statements</th>
<th>p &lt;0.05</th>
<th>Rho</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q4</td>
<td>Readers expect crime fiction novels to contain forensic science.</td>
<td>0.0169</td>
<td>0.3956</td>
</tr>
<tr>
<td>Q5</td>
<td>Readers take crime fiction that contains forensic science more seriously.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q6</td>
<td>The advent of forensic TV programmes such as CSI has increased the pressure on writers to include forensic science in their novels.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q7</td>
<td>Readers believe the forensic science they read in crime fiction is true and accurate.</td>
<td>0.0057</td>
<td>0.0057</td>
</tr>
<tr>
<td>Q8</td>
<td>Readers believe the accuracy of science written in a novel more than the accuracy of science they see in a TV programme such as CSI.</td>
<td>0.0102</td>
<td>0.4172</td>
</tr>
<tr>
<td>Q9</td>
<td>I like to thoroughly research the forensic science I use in my novels.</td>
<td></td>
<td>0.3526</td>
</tr>
<tr>
<td>Q10</td>
<td>I always ensure the science I include in my fiction is correct.</td>
<td>0.0041</td>
<td>0.4609</td>
</tr>
<tr>
<td>Q12</td>
<td>I feel an ethical obligation to ensure the forensic science included in my novels is correct.</td>
<td>0.0360</td>
<td>0.0360</td>
</tr>
<tr>
<td>Q13</td>
<td>I worry that a reader will point out a factual error in my work.</td>
<td>0.0010</td>
<td>0.5189</td>
</tr>
<tr>
<td>Question</td>
<td>Statements</td>
<td>$p$</td>
<td>Rho</td>
</tr>
<tr>
<td>----------</td>
<td>----------------------------------------------------------------------------</td>
<td>------</td>
<td>------</td>
</tr>
<tr>
<td>Q9</td>
<td>I like to thoroughly research the forensic science I use in my novels.</td>
<td>0.0001</td>
<td>0.6087</td>
</tr>
<tr>
<td>Q10</td>
<td>I always ensure the science I include in my fiction is correct.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q9</td>
<td>I like to thoroughly research the forensic science I use in my novels.</td>
<td>&lt;0.0001</td>
<td>0.6484</td>
</tr>
<tr>
<td>Q12</td>
<td>I feel an ethical obligation to ensure the forensic science included in my novels is correct.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q9</td>
<td>I like to thoroughly research the forensic science I use in my novels.</td>
<td>0.0219</td>
<td>0.3757</td>
</tr>
<tr>
<td>Q13</td>
<td>I worry that a reader will point out a factual error in my work.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q9</td>
<td>I like to thoroughly research the forensic science I use in my novels.</td>
<td>0.0274</td>
<td>0.3626</td>
</tr>
<tr>
<td>Q15</td>
<td>I am concerned about the potential for copycat crime as a result of my fiction writing.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q9</td>
<td>I like to thoroughly research the forensic science I use in my novels.</td>
<td>0.0113</td>
<td>0.4176</td>
</tr>
<tr>
<td>Q18</td>
<td>I am concerned that perpetrators will learn how to avoid leaving behind evidence as a result of reading my crime fiction.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q9</td>
<td>I like to thoroughly research the forensic science I use in my novels.</td>
<td>0.0068</td>
<td>0.4370</td>
</tr>
<tr>
<td>Q19</td>
<td>I have purposefully withheld scientific information in my novels due to my concern for potential copycat crime occurring.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q10</td>
<td>I always ensure the science I include in my fiction is correct.</td>
<td>0.0001</td>
<td>-0.6039</td>
</tr>
<tr>
<td>Q11</td>
<td>I am happy to have slightly incorrect scientific information if it advances the story.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q10</td>
<td>I always ensure the science I include in my fiction is correct.</td>
<td>&lt;0.0001</td>
<td>0.8193</td>
</tr>
<tr>
<td>Q12</td>
<td>I feel an ethical obligation to ensure the forensic science included in my novels is correct.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q10</td>
<td>I always ensure the science I include in my fiction is correct.</td>
<td>0.0044</td>
<td>0.4582</td>
</tr>
<tr>
<td>Q13</td>
<td>I worry that a reader will point out a factual error in my work.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Question</td>
<td>Statements</td>
<td>p</td>
<td>Rho</td>
</tr>
<tr>
<td>----------</td>
<td>------------------------------------------------------------------------------</td>
<td>-----------</td>
<td>-----------</td>
</tr>
<tr>
<td>Q10</td>
<td>I always ensure the science I include in my fiction is correct.</td>
<td>0.0363</td>
<td>0.34553</td>
</tr>
<tr>
<td></td>
<td>I have purposefully withheld scientific information in my novels due to my concern for potential copycat crime occurring.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q11</td>
<td>I am happy to have slightly incorrect scientific information if it advances the story.</td>
<td>&lt;0.0001</td>
<td>-0.6157</td>
</tr>
<tr>
<td>Q12</td>
<td>I feel an ethical obligation to ensure the forensic science included in my novels is correct.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q13</td>
<td>I worry that a reader will point out a factual error in my work.</td>
<td>0.0003</td>
<td>0.5666</td>
</tr>
<tr>
<td>Q14</td>
<td>I feel an ethical obligation to ensure the forensic science included in my novels is correct.</td>
<td>0.0124</td>
<td>0.4069</td>
</tr>
<tr>
<td>Q15</td>
<td>I am concerned about the potential for copycat crime as a result of my fiction writing.</td>
<td>0.0002</td>
<td>0.5748</td>
</tr>
<tr>
<td>Q16</td>
<td>I am concerned that perpetrators will learn how to avoid leaving behind evidence as a result of reading my crime fiction.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q17</td>
<td>I am concerned about the potential for copycat crime as a result of my fiction writing.</td>
<td>&lt;0.0001</td>
<td>0.6981</td>
</tr>
<tr>
<td>Q18</td>
<td>I have purposefully withheld scientific information in my novels due to my concern for potential copycat crime occurring.</td>
<td>0.0066</td>
<td>0.4448</td>
</tr>
<tr>
<td>Q19</td>
<td>I am concerned that perpetrators will learn how to avoid leaving behind evidence as a result of reading my crime fiction.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>I have purposefully withheld scientific information in my novels due to my concern for potential copycat crime occurring.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
5 Chapter Five: Results of the reader survey
- Do you believe the science you read in crime fiction?

The third research element of this thesis was the survey of readers to examine their attitudes towards the science they included in their fiction. The survey gave a reader or user’s perspective to the question “can science be communicated through crime fiction.” It did this by presenting questions that evaluated their belief in the accuracy of the science incorporated into the crime fiction novels they read, and in their expectations of accuracy.

5.1 Survey response rate

The online anonymous reader’s survey “Do you believe the science you read in crime fiction” attracted a total of 1021 respondents. The introductory material to potential respondents indicated the survey was specifically for readers of crime fiction. The first screening question was “Do you read crime fiction?” Eleven participants responded “no” to this question and were directed to the end of the survey and thanked for their interest. The number of participants responding to each statement in the survey differed, as it was possible for respondents to miss individual questions and advance to the next. This approach was used to encourage respondents to complete the survey, rather than opt out if they encountered a difficult question. Individual question responses varied from 773 to 965.

The series of survey questions offered statements to which participants were asked to indicate their level of agreement or disagreement on a five-point Likert-type scale, with the options of agree strongly, agree, neutral, disagree, disagree strongly. Open text boxes were also offered for each statement to allow text comments from respondents. In the statement response results that follow, the five anchor points of the Likert-type scale
were collapsed into three categories: “agree strongly” and “agree” were merged into “agree” or “positive,” “neutral” remained as “neutral,” and “disagree strongly” and “disagree” were merged into “disagree” or “negative.” This was to indicate the direction of response from participants as discussed in Chapter 2: Methods. Correlation analysis was undertaken using Spearman’s correlation coefficient ($p$) testing on the five-point data, and results were considered significant when $p<0.05$.

Open text box comments for each statement were coded using nVivo software and themes identified (Appendix 10). The themes identified and discussed in the reader survey differ from those in the author survey due to the different emphasis and perspective of the statements presented. The reader survey statements canvassed opinion on author’s accuracy and use of science, whereas the author survey canvassed the author’s attitude to their own use of science, and how they perceived the reader’s response to it. In the descriptive text for the statement analysis that follows, the word “theme” refers to the themes identified through coding the open text box responses using nVivo software.

5.2 Participant demographics

5.2.1 Gender of participants of the reader survey

The participants in the reader survey were 87% female and 13% male ($n=836$).

The age of respondents was symmetrically distributed across the mid-age bands with 20% aged between 30-39 years, 26% aged between 40-49 years, 25% aged between 50-59 years and 15% aged between 60-69 years (Figure 21). This distribution approximated the general population age of New Zealand, where 33% are aged 15-39, 33% aged 40-64, and 16% aged 65+ (Statistics New Zealand 2014b). It also approximated the general population age of the United States of America, one of the large group of respondents (CIA. 2016)
The respondents to the reader survey were well educated with 75% having some form of tertiary education, and 38% of those having a postgraduate qualification (Figure 22).
Participants were asked to name their country of residence. The countries were then condensed into five major geographical regions; the Americas, Oceania, Europe, Asia and Africa. The majority of participants resided in the Americas (42%) and Oceania (40%), with Europe represented by 17% of participants (Figure 23). The ratio of participants’ countries of residence altered considerably over time during the period the survey was open. This was most likely a result of using snowball sampling methods. The effects of time on the country of residence in the reader survey is discussed later in this chapter.

Figure 23: Reader survey respondent geographical region of residence (n = 798).
5.3 Reader responses to survey questions and statements

The results for each individual statement are presented in the order in which they appeared for the participants of the survey. The heading for each section that follows is the statement given to survey participants to respond to on the Likert-type scale. For each statement, the Likert-type scale responses are presented as a percentage, and they are contextualised by the nVivo thematic responses gathered from those participants who made comments in the open text boxes. The nVivo software does not give a specific numerical output, so themes are described subjectively as being predominant or strong. Whereas the Likert-type scale results are expressed as percentages, actual numbers of respondents who made comments are cited when discussing the themes, and the relative strength of the themes are divided according to those who had made a positive, neutral or negative response to the Likert–type scale. Illustrative quotes from open text box comments are also given as examples of the opinions expressed by participants.
5.3.1 I like to read crime fiction that includes the use of forensic science

The majority of respondents agreed with this statement (91%), with less than one percent disagreeing (Figure 24). A total of 64 of the 963 respondents made comments in the open text box: 50 of whom had responded positively to the statement, 13 neutrally, and 1 negatively. The predominant theme expressed through open text box comments was that although participants liked to read crime fiction that included forensic science, plot, character or story were more important to them. An example of this was, “The use of forensic science is not an overall consideration in choosing a crime book. More central to me is the central character - is this a detective/sleuth whose life journey I have been following. Some of the crime stories I have most enjoyed have been set in times when even the use of fingerprints was a novel crime solving device.” Another emergent theme expressed was that science enhanced the story, “It makes it seem more real and likely to be true.” The participant who gave a negative response to the statement commented “I find the inaccuracies frustrating and detract from the story.”

Figure 24: Question 2: I like to read crime fiction that includes the use of forensic science (n = 963).
5.3.2 I find crime fiction novels that contain forensic science are more believable

There was a strong positive response to the statement (74%) with only 4% disagreeing (Figure 25). Of the 52 participants who made comments in the open text box, 26 had made a positive response, 22 a neutral response and four negative. Three predominant themes emerged from the text box comments; the science must be accurate; it depended on the author; and it depended on the context or genre of the novel. The themes were spread evenly between the positive and neutral responders. An example of a response from a positive respondent was “They are more believable, but only if you have no knowledge on the subject. I’m more inclined to read books by authors such as Patricia Cornwell and Tess Gerritson. Cornwell worked in a Medical Examiner’s office, and Gerritson is a physician.” The importance of context or genre was typified by the comment “As long as the techniques are correctly used in the right context it adds to the believability of the story and scientific characters.”

![Bar chart showing agreement levels.](image)

**Figure 25: Question 3: I find crime fiction novels that contain forensic science are more believable (n = 965).**
5.3.3 I read crime fiction purely for entertainment

The majority of participants agreed with this statement (88%) (Figure 26). Of the 53 participants who made text box comments, 31 had responded positively. Many of the 4% of participants who responded negatively to the survey statement also made comments (34%). The predominant theme from those who disagreed with the statement was that they liked to learn from crime fiction. This was also a strong theme for those who responded positively, as well as the theme, ‘the story was more important.’ An example of a comment from a participant who responded negatively to the statement was “I agree that crime fiction can be purely for entertainment but I think the best crime fiction, like the best of all genre fictions, tell us something more about the world or people or society and those are the ones I enjoy the most. When I find an author that does so, I tend to follow their work.”

Figure 26: Question 4: I read crime fiction purely for enjoyment (n = 963).
5.3.4 When I read crime fiction I am interested in the forensic science as well as the story

Positive responses were predominant for this statement with 81% of readers agreeing, and 4% disagreeing (Figure 27). Of the 29 people who wrote in the open text box, 19 had responded positively. No predominant theme emerged from the text boxes, reader’s comments were distributed across several themes. An example from the text box comment of a positive responder was “In some ways the science can be more important than the story. It’s vital to know why certain processes and techniques are used and when.” Another positive responder noted “Sometimes this is true but not always...so sometimes I would choose ‘neutral.’” The one text box commenter who had responded negatively stated “The forensic science is just there to propel the plot; a means to an end.” A neutral responder commented, “If the plot is very exciting I will be tempted to skip detailed forensic information to move forward. I may go back and reread for the detail.”

Figure 27: Question 5: When I read crime fiction I am interested in the forensic science as well as the story ($n = 963$).
5.3.5 I like to learn some interesting forensic science when I read crime fiction

The majority of participants responded positively to this statement (80%) and 4% disagreed (Figure 28). Of the 32 participants who wrote a comment in the open text box, 18 had responded positively to the statement and 4 negatively. Two predominant themes emerged from the text box comments – that people learned information from the novel, and that the science must be accurate. An example of a comment from a positive responder was “However the forensic science must be based on factual information or it makes the story less believable.” A neutral responder commented “I’m not against learning something new, but it’s not necessarily a prerequisite.” The comment from one negative responder was “I only think that the information is based loosely on reality - therefore I don’t take too much note of it, but it does add another layer of interest.”

Figure 28: Question 6: I like to learn some interesting forensic science when I read crime fiction (n = 960).
5.3.6 I expect to learn some interesting forensic science when I read crime fiction

The language of this statement asked a subtly different question from the previous statement, leading participants from I ‘like’ to learn some interesting forensic science to I ‘expect’ to learn some interesting forensic science when I read crime fiction. This resulted in a decrease in the number of positive respondents (51%) and increase in the number of both neutral respondents (33%) and negative respondents (16%) (Figure 29).

![Bar chart showing the distribution of responses to Question 7]

**Figure 29: Question 7: I expect to learn some interesting forensic science when I read crime fiction (n = 960).**

Of the 38 participants who commented in the open text box, there were a similar number of positive and neutral respondents, and 7 negative respondents. The two predominant themes that emerged from the text box comments were that the science must be accurate, and that it depended on the author. One negative respondent’s comment was “I don’t believe everything I read, so I wouldn’t rely on something learned from a work of fiction.” A comment from a positive respondent was “Depends on the author, of course. Some authors are better informed so I expect more from them.” A number of commenters placed their expectation in the context of
the date of publication of the novel, acknowledging the advances of forensic science in more recent history; “If it was written in the last 20 years.” A neutral responder commented, ‘expect is a strong word... I know a lot already, so I don’t really expect to learn anything new, but always like to.”

5.3.7 It is important to me that the forensic science in crime fiction novels is true and accurate

The majority of participants indicated it was important for them that the forensic science in crime fiction novels was true and accurate, with 87% agreeing and 4% disagreeing (Figure 30). This statement attracted more comments than the previous statements, with 60 participants also writing in the open text box. Of those, 40 had responded positively to the statement and 5 negatively. The predominant theme that emerged from the open text boxes was “the science must be accurate,” which reflected the wording of the statement. Representative of comments from the positive respondents was, “If it is going to be used to drive the plot forward then I want to be certain it is accurate.” A common theme among the negative respondents was that it was fiction or entertainment, “Crime fiction is, actually, fiction.”

Figure 30: Question 8: It is important to me that the forensic science in crime fiction novels is true and accurate (n = 856).
5.3.8 I believe the forensic science in crime fiction is true and accurate

Less than half of the respondents agreed with the statement (47%), and 40% responded neutrally, with 13% disagreeing (Figure 31). This statement drew 151 text box comments, with 62 comments from positive respondents, 69 from neutral respondents and 20 from negative respondents. The dominant theme across the range of comments from both positive and neutral respondents was “it depends on the author.” Patricia Cornwell’s name was mentioned specifically as a writer who readers trusted on 17 occasions - “I agree for Cornwell but neutral on other authors.” One negative respondent when commenting on the statement, “I believe the forensic science in crime fiction is true and accurate,” was adamant – “No it’s not. Can’t be. Not possible.”

![Figure 31: Question 9: I believe the forensic science in crime fiction is true and accurate (n = 853).](image-url)
5.3.9 I believe most writers take care to ensure the forensic science they use in crime fiction is true and accurate

Readers demonstrated confidence that most writers took care to ensure science was accurate, with 69% responding positively to the statement and 8% disagreeing (Figure 32). Of the 86 participants who made open text box comments, 52 had responded positively to the statement, and 28 neutrally. The predominant theme that emerged from the comments of both positive and neutral respondents was it depended on the author. One neutral responder stated, “Depends on author and purpose for using forensic science in the storyline.” A negative responder stated, “In writing crime fiction I imagine the intention is to increase drama through any writing means possible—e.g. embellishing forensics.”

![Figure 32: Question 10: I believe most writers take care to ensure the forensic science they use in crime fiction is true and accurate (n = 851).](image)
5.3.10  Please name some crime writers you feel you can trust to provide true and accurate forensic science in their crime fiction novels

Participants were invited to write names of one or more authors they trusted to provide true and accurate science in an open text box. Most responded, with 731 participants recording a total of 1590 names. These covered 231 different authors. The most trusted author was Patricia Cornwell, with 40.8% of the count, followed by Kathy Reichs at 17.9%. After these two writers, the number of votes decreased to less than 4%. The top ten most trusted authors were tabulated (Table 4). Both Cornwell and Reichs are known as both writers and professionals in their scientific fields, with Cornwell being a medical examiner and Reichs a forensic anthropologist. It was presumed that responses to this question would also be heavily influenced by readers’ range of reading and knowledge of authors, with most authors in the top ten being international best-selling authors, compared to the other end of the scale, where many authors who recorded one or two votes were not as well known.

<table>
<thead>
<tr>
<th>Author</th>
<th>Frequency</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patricia Cornwell</td>
<td>568</td>
<td>35.7</td>
</tr>
<tr>
<td>Kathy Reichs</td>
<td>249</td>
<td>15.7</td>
</tr>
<tr>
<td>James Patterson</td>
<td>54</td>
<td>3.4</td>
</tr>
<tr>
<td>Tess Gerritsen</td>
<td>50</td>
<td>3.1</td>
</tr>
<tr>
<td>Jeffery Deaver</td>
<td>46</td>
<td>2.9</td>
</tr>
<tr>
<td>Karin Slaughter</td>
<td>32</td>
<td>2.0</td>
</tr>
<tr>
<td>Michael Connelly</td>
<td>26</td>
<td>1.6</td>
</tr>
<tr>
<td>Ian Rankin</td>
<td>24</td>
<td>1.5</td>
</tr>
<tr>
<td>PD James</td>
<td>24</td>
<td>1.5</td>
</tr>
<tr>
<td>Vanda Symon</td>
<td>23</td>
<td>1.4</td>
</tr>
</tbody>
</table>
5.3.11 Please name some crime writers you do NOT trust to provide true and accurate forensic science in their novels.

Whereas 731 participants responded to the question asking them to name trusted authors, only 381 responded to this question asking them to name authors they did not trust. Of those respondents, 134 provided the name of an author or authors, the remainder chose to write comments or fillers such as “can’t think of any,” or “too many to mention.” or “I don’t know.” There were 183 names given by the participants in total, with 74 individual authors named.

The least trusted author was James Patterson, representing 17.5% of the author names provided by participants. Patricia Cornwell had been named as the most trusted author from the previous question, but she also was placed as the third least trusted author (4.9%) (Table 5).

The large reduction in respondents compared to the previous question suggested a reluctance from readers to actively name writers they did not trust. Naming and shaming an author made many feel uncomfortable. Three expressed their reluctance in the comments.

“I’m not sure this is a particularly fair question as everybody must distort the facts to get it into the frame of a book.”

“I’d rather not.”

“That is a highly presumptuous question that I don’t feel I have the knowledge to judge nor right to presume of any particular author.”
Table 5: Top ten non-trusted authors. (% of 183 total occurrences)

<table>
<thead>
<tr>
<th>Author</th>
<th>Frequency</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>James Patterson</td>
<td>32</td>
<td>17.5</td>
</tr>
<tr>
<td>Agatha Christie</td>
<td>12</td>
<td>6.6</td>
</tr>
<tr>
<td>Patricia Cornwell</td>
<td>9</td>
<td>4.9</td>
</tr>
<tr>
<td>Lee Child</td>
<td>8</td>
<td>4.4</td>
</tr>
<tr>
<td>Janet Evanovich</td>
<td>8</td>
<td>4.4</td>
</tr>
<tr>
<td>Jeffery Deaver</td>
<td>7</td>
<td>3.8</td>
</tr>
<tr>
<td>Harlan Coben</td>
<td>6</td>
<td>3.3</td>
</tr>
<tr>
<td>Dan Brown</td>
<td>5</td>
<td>2.7</td>
</tr>
<tr>
<td>Sue Grafton</td>
<td>5</td>
<td>2.7</td>
</tr>
<tr>
<td>Robin Cook</td>
<td>5</td>
<td>2.7</td>
</tr>
</tbody>
</table>
5.3.12 If I find errors in the forensic science used in a novel, it affects my belief in all aspects of the novel

For this statement 46% of participants agreed and 23% disagreed, while 31% remained neutral (Figure 33). Of the 107 participants who made comments in the open text boxes 38 had agreed with the statement, 48 had remained neutral and 28 had disagreed. The predominant theme for this statement was it was fiction and entertainment. This was particularly so for the participants who had responded negatively to the statement. As one stated, “I read novels for the pleasure of a “good read”, not to gain forensic knowledge!” Neutral respondents also tended to the theme it was fiction and entertainment. One commented “Generally I accept the novel is for entertaining reading, rather than learning or education, and I leave it as that – entertainment.”

Another repeated theme among neutral responders was they did not feel qualified enough to recognise an error. “I doubt I would recognize any errors in most cases.” The predominant theme from positive responders was that inaccuracy detracted from the story – “If there are major errors in the forensic aspect of a novel, I generally lose interest and will not purchase books from that author again. Basically if I can find forensic errors by simple research then there is no reason an author should take that type of liberty with their writing.”
5.3.13 Watching forensic TV programmes such as CSI has increased my expectation on writers to include forensic science in their novels

There was a positive response from 45% of participants to this statement, and negative responses from 27% (Figure 34). Of the 111 participants who made text box comments, 20 had responded positively, 39 neutrally and 52 negatively to the statement. A positive responder commented “It certainly improves its appeal for many of us who watch and learn and hope it helps make sense of something we may question in real life...” The major theme from those who had responded negatively was they did not watch CSI type programmes. This theme was also strong in the neutral respondents. The other major theme that emerged was that CSI was not real. A comment from a neutral responder was “Not really, and I doubt they’re an accurate reflection of the day-to-day timescales and abilities of most police forces.” One negative responded stated ‘I find CSI etc less believable than novels. I’m molecular genetics trained (PhD), so if I *see* them do a technique and its wrong or poorly done I judge more than if I *read* that “[technique] was performed and showed [X]” - I assume, of course, that they did it correctly.”

Figure 34: Question 14: Watching forensic TV programmes such as CSI has increased my expectation on writers to include forensic science in their novels (n = 828).
5.3.14 I believe the accuracy of science written in a novel more than the accuracy of the science I see in a TV programme such as CSI

The majority of the respondents agreed with the statement (53%), and 12% disagreed (Figure 35). Of the 78 participants who made text box comments, 36 had responded positively, 32 neutrally and 10 negatively. The predominant themes that emerged were that CSI type programmes weren’t true, and that it was fiction and entertainment. One positive responder argued “An author can do up to 1y of background research & most are reviewed by specialists. TV series are exaggerated...” The advantage of a novelist’s time frame was mentioned by a number of commenters. A neutral responder commented “I recognize both utilize science as part of the core statements supporting storyline. But I also recognize the entertainment genre is to entertain more than educate.” A number of commenters, including this example pointed out “They’re both fiction :)

Figure 35: Question 15: I believe the accuracy of science written in a novel more than the accuracy of the science I see in a TV programme such as CSI (n = 843).
Do you have any further comments?

Participants were given the opportunity to make additional comments about the survey topic, and over a quarter chose to do so (267 individuals). Throughout the survey respondents were very generous with the number and richness of the comments made. Comments were often several sentences long and in depth. The additional comments were coded using nVivo and themes identified. Below is a selection of comments that illustrate the major themes that emerged, and that also summarise the general points made by a number of the participants.

The predominant theme that emerged from these comments was that the **plot and character were most important**. Examples of comments supporting this theme were:

“The story still needs to be the prime focus. I don’t like the science getting so complex that it detracts/disrupts the flow of the story. I read for enjoyment first and foremost but also enjoy the mental stimulation of the investigative process of which forensic analysis is but one part.”

“If it helps the plot and outcome - good - but if not I don’t care. Character and plot are important to me. Forensic science is interesting at best, distracting at worst.”

“It isn’t necessary to explain the Science in too much depth as it is the story I want to read. I also enjoy old crime which involves very little forensic science. I believe it is primarily the story which we enjoy and escape into. The forensic science is purely there to help the story along rather than being the focus of why the story is plausible. In my opinion forensic science can be interesting but not necessary if the story is good.”

One perceptive reader made this comment – “I tell myself that any science in novels or TV shows is just there to support the plot, and that I don’t really care if it’s perfectly accurate. My concern is that simply because I read these ideas repeatedly I will start to believe that these things ARE true and not remember where I heard them.” This reflects the findings of Appel and Richter that narrative is a persuasive form of writing (Appel and Richter 2007).
A second strong theme was that the science must be accurate. Examples of statements supporting this theme are given below.

“Writers must ensure they are accurate and factual. I also like the element of surprise, the unusual (with regards to forensic science) and I like books that cover a wide spectrum of forensic sciences - not just blood typing, DNA and fingerprints.”

“Unless an author is willing to do the research to ensure the forensic science in his novel are reasonably accurate, he has no business including them. It would be better to have no forensic science in the story than to have blatantly wrong forensic science.”

“I expect a fair degree of accuracy of any forensic science details in crime fiction – just as I expect a fair degree of accuracy with other factual details such as historical, cultural, geographical and other factors.”

“While I don’t believe everything I read, I like to be educated about a world with which I am not familiar. The reader must often suspend belief while reading, but crime fiction is not usually billed as fantasy, so one expects accuracy. I would not buy another novel by an author who really bends the truth in crime fiction.”

“They add another level of intrigue to the story but it isn’t absolutely necessary to the story unless the character is one that works in the field. Sometimes, it can overshadow a good story and almost ruin the book if used too much or incorrectly/inaccurately.”

“When I read crime fiction I expect the writer to have taken as much care as possible to be accurate about forensic science - I would expect them to want to avoid embarrassing errors that they might be called on in the media - but I also wouldn’t rely on their version of the science. Partly because writers are famously reluctant to let facts get in the way of a good story, and partly because there is widespread inaccuracy in eg the reporting of science in the media (from statistics to environmental science to medicine), stemming from a basic lack of understanding of technical scientific concepts. I would expect most crime writers’ understanding of forensic science to be fairly simplistic, and for this to be translated into inadvertent inaccuracies and oversimplifications.”
The third major theme that emerged from the open text box was that **science enhanced the story**. Examples of statements supporting this theme are given below.

“I feel that as long as it doesn’t read like a medical text book it can really enhance the novel.”

“Reading a novel with forensic science involved makes me feel more in touch with the novel for sure. It immerses me more into the characters and plots by pulling me into the involvement stage. It feels more real and increases the intensity of the novel for me.”

Some commenters framed the use of forensic science within the context of the novel. “I think it is an aid to story line. The use of contemporary societal ‘knowledge’ of forensic science is important to include in contemporary fiction as it reflects the reading community expectation. Equally the forensic science expectation must reflect the era of the novel setting, fingerprints versus DNA. etc.”

“I believe forensic novels are more accurate than TV shows. But then I also believe books contain lots more details than TV shows and movies.”

These quotes eloquently summarise the thoughts expressed by many of the participants who made additional comments:

“But when we sit down in a comfy chair with a book we’ve been longing to read we set off on a mental adventure, a testing of our own physical senses. There is something quite stimulating and thrilling to be able to read detailed, clever descriptive writing of quite intensive forensic information. it [sic] makes us feel we are part of the investigative team. I do feel readers are entitled to be enfolded in all the exciting events, as well as learn about the disappointments and setbacks when even with careful work, plans can go awry!”

“To me forensic science is not an issue that affects my reading decision making. To me, the most important aspect of crime stories is the plot - is it twisty-turny enough to keep me guessing, is the outcome believable; the characters - do they develop and grow, are the credible as people, are they well-rounded and most importantly, what did this novel show me about human nature. Is this a story
where the crime develops from ordinary people in extraordinary circumstance or is it one where the evil is portrayed as being outside the mainstream? The prevalence or otherwise of forensic science is just the detective’s tool-kit, a springboard to plot development rather like the presence or absence of cellphones. The detective might get there quicker with modern technology but without it he/she would get there another way.”

5.4 Correlation analysis between reader survey statements

Spearman’s correlation coefficients were calculated between each of the survey questions using STATA 11.2. software. The correlation test was used to analyse for relationships between the responses to the reader survey.

Correlation coefficients and significance level were tested between each question (variable) that required a response on the five-point Likert-type scale (Table 6). Fifty-five out of a possible 66 pairs of statements showed a significant positive correlation in participant responses (p<0.05).

The complete table of correlations between reader survey statements is recorded in Appendix 11.
### Table 6: Reader survey questions correlation statistics (p<0.05)

<table>
<thead>
<tr>
<th>q2</th>
<th>q3</th>
<th>q4</th>
<th>q5</th>
<th>q6</th>
<th>q7</th>
<th>q8</th>
<th>q9</th>
<th>q10</th>
<th>q13</th>
<th>q14</th>
<th>q15</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>q2</td>
<td>1.0000</td>
<td>1020</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>q3</td>
<td>0.5500</td>
<td>1.0000</td>
<td>965</td>
<td>965</td>
<td>&lt;0.0001</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>q4</td>
<td>0.0545</td>
<td>0.0349</td>
<td>1.0000</td>
<td>963</td>
<td>961</td>
<td>963</td>
<td>0.0911</td>
<td>0.2804</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>q5</td>
<td>0.5977</td>
<td>0.4893</td>
<td>0.0370</td>
<td>1.0000</td>
<td>963</td>
<td>960</td>
<td>958</td>
<td>963</td>
<td>&lt;0.0001</td>
<td>&lt;0.0001</td>
<td>0.2528</td>
</tr>
<tr>
<td>q6</td>
<td>0.5702</td>
<td>0.5179</td>
<td>-0.0177</td>
<td>0.6806</td>
<td>1.0000</td>
<td>960</td>
<td>957</td>
<td>955</td>
<td>956</td>
<td>960</td>
<td></td>
</tr>
<tr>
<td>q7</td>
<td>0.4625</td>
<td>0.5202</td>
<td>-0.0578</td>
<td>0.5372</td>
<td>0.6415</td>
<td>1.0000</td>
<td>960</td>
<td>958</td>
<td>957</td>
<td>953</td>
<td>960</td>
</tr>
<tr>
<td>q8</td>
<td>0.2975</td>
<td>0.3069</td>
<td>0.0043</td>
<td>0.3585</td>
<td>0.4296</td>
<td>0.3963</td>
<td>1.0000</td>
<td>856</td>
<td>853</td>
<td>852</td>
<td>851</td>
</tr>
<tr>
<td>q9</td>
<td>0.2600</td>
<td>0.3418</td>
<td>0.0266</td>
<td>0.2846</td>
<td>0.2976</td>
<td>0.3483</td>
<td>0.3248</td>
<td>1.0000</td>
<td>853</td>
<td>850</td>
<td>849</td>
</tr>
<tr>
<td>q10</td>
<td>0.1641</td>
<td>0.2564</td>
<td>0.0379</td>
<td>0.1815</td>
<td>0.2107</td>
<td>0.2623</td>
<td>0.2300</td>
<td>0.5089</td>
<td>1.0000</td>
<td>851</td>
<td>848</td>
</tr>
<tr>
<td>q13</td>
<td>0.1127</td>
<td>0.1826</td>
<td>-0.0953</td>
<td>0.1840</td>
<td>0.2168</td>
<td>0.2025</td>
<td>0.3821</td>
<td>0.1677</td>
<td>0.1099</td>
<td>1.0000</td>
<td>844</td>
</tr>
<tr>
<td>q14</td>
<td>0.1824</td>
<td>0.3042</td>
<td>0.0818</td>
<td>0.1912</td>
<td>0.2503</td>
<td>0.3238</td>
<td>0.1647</td>
<td>0.2378</td>
<td>0.2675</td>
<td>0.2104</td>
<td>1.0000</td>
</tr>
<tr>
<td>q15</td>
<td>0.1352</td>
<td>0.1494</td>
<td>-0.0062</td>
<td>0.1667</td>
<td>0.1942</td>
<td>0.1723</td>
<td>0.1788</td>
<td>0.1766</td>
<td>0.1290</td>
<td>0.2226</td>
<td>0.0143</td>
</tr>
</tbody>
</table>
5.5 Snowball sampling and effects of time on participant responses

Snowball sampling was used to recruit participants to the reader survey. The survey opened on 14 October 2013, and closed on 3 November 2014. On 2 August 2014, the number of participants rose sharply with 408 participants completing the survey on that date, and a further 130+ surveys being completed in the following days (Figure 36). This would suggest the survey link was posted on the social media of a large organisation or reader interest group. Due to the surveys being anonymous, and the nature of snowball sampling where shares cannot be tracked, this group has not been able to be precisely identified.

Figure 36: Responses received for reader survey over time (n = 1009).
5.5.1 Division of the reader survey into time-based tertiles

In order to assess the effects of time on the demographics and responses of the participants, the participants were divided into three groups (tertiles) based on the date of survey completion. The divisions were made in four-month increments. The tertile division was based on date as opposed to dividing the participants into three groups of equal numbers. The equal division of numbers method would have split the participants involved in the August spike, therefore removing the ability to analyse their responses as a group.

Those who responded between the opening date of 14 October 2013 and 14 February 2014 were labeled Tertile 1 and represented early responders. Those who responded between 15 February 2014 and 14 June 2014 were labeled Tertile 2 and represented mid responders, and those who responded between 15 June 2014 and the closing date of 3 November 2014 were labeled Tertile 3 and represented late responders. Tertile 3 included those participants in the spike of respondents that occurred on the 2nd, 3rd and 4th of August 2014. Tertile 1 had 95 respondents, Tertile 2 had 142 respondents, and Tertile 3 had 795 respondents.

The region of residence changed markedly over the three tertiles (Figure 37). Early and mid-responders to the survey (Tertiles 1 and 2) were predominantly from Oceania whereas the late responders, incorporating the response spike seen in Tertile 3, were predominantly from the Americas, with a large number also from Europe. This suggests the online survey link was shared on a large United States based, internationally reaching reader group or forum site. Analysis of the country of origin of these participants who responded during the spike and who completed the demographic questions indicated 327 were from the Americas, 129 from Europe and 109 from Oceania. A table of participant country of residence is in Appendix 12.
The age of participants varied across the tertile groups. The second tertile had a peak of participants in the 50-59 year age band (Figure 38).
5.5.2 Correlation analysis of time-based tertiles and reader survey responses

Each of the reader survey statement responses was divided into the time-based tertiles and tested for significance using the Spearman correlation coefficient (Table 7). The purpose of undertaking this analysis was to examine any changes in responses between early, mid and late respondents.

The correlations between time-based tertiles and statement responses returned significant p values, with the exception of two; questions 4 and 13. All of the Spearman correlation coefficients were negative, indicating that the score for each question on the Likert-type scale decreased towards strongly agreeing (or a score of 1) as time of response progressed.

The tables of individual tertile versus participant response for each statement are in Appendix 13.
Table 7: Spearman correlation coefficients for time-based tertiles and reader survey responses ($p<0.05$).

<table>
<thead>
<tr>
<th>Statement</th>
<th>Rho</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q2 I like to read crime fiction that includes the use of forensic science</td>
<td>-0.3687</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Q3 I find crime fiction novels that contain forensic science are more believable</td>
<td>-0.2558</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Q4 I read crime fiction purely for entertainment</td>
<td>-0.0409</td>
<td>0.2049</td>
</tr>
<tr>
<td>Q5 When I read crime fiction I am interested in the forensic science as well as the story</td>
<td>-0.2950</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Q6 I like to learn some interesting forensic science when I read crime fiction</td>
<td>-0.2748</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Q7 I expect to learn some interesting forensic science when I read crime fiction</td>
<td>-0.2488</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Q8 It is important to me that the forensic science in crime fiction novels is true and accurate</td>
<td>-0.1625</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Q9 I believe the forensic science in crime fiction is true and accurate</td>
<td>-0.1835</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Q10 I believe most writers take care to ensure the forensic science they use in crime fiction is true and accurate</td>
<td>-0.0832</td>
<td>0.0152</td>
</tr>
<tr>
<td>Q13 If I find errors in the forensic science used in a novel it affects my belief in all aspects of the novel</td>
<td>-0.0243</td>
<td>0.4806</td>
</tr>
<tr>
<td>Q14 Watching forensic TV programmes such as CSI has increased my expectation on writers to include forensic science in their novels</td>
<td>-0.1247</td>
<td>0.0003</td>
</tr>
<tr>
<td>Q15 I believe the accuracy of science written in a novel more than the accuracy of the science I see in a TV programme such as CSI</td>
<td>-0.0961</td>
<td>0.0052</td>
</tr>
</tbody>
</table>
5.5.3 Correlation analysis of time-based tertiles and reader survey demographic information

Correlations over time for the demographics of reader participants were also investigated using the time-based tertiles. The purpose of undertaking this analysis was to examine any significant differences in participant profiles between early, mid and late respondents.

There was no significant effect of time-based tertile on gender distribution in the reader survey (Table 8).

**Table 8: What is your gender (p = 0.072).**

<table>
<thead>
<tr>
<th>Tertile</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>16.4</td>
<td>83.6</td>
</tr>
<tr>
<td>2</td>
<td>16.7</td>
<td>83.3</td>
</tr>
<tr>
<td>3</td>
<td>11.6</td>
<td>88.4</td>
</tr>
</tbody>
</table>

There was no significant effect of time-based tertiles on the age of reader survey participants (Table 9).

**Table 9: What is your age in years? (p = 0.271).**

<table>
<thead>
<tr>
<th>Tertile</th>
<th>&lt;29</th>
<th>30-39</th>
<th>40-49</th>
<th>50-59</th>
<th>60-69</th>
<th>70+</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>12.5</td>
<td>16.7</td>
<td>22.2</td>
<td>19.4</td>
<td>19.4</td>
<td>9.7</td>
</tr>
<tr>
<td>2</td>
<td>22.4</td>
<td>7.5</td>
<td>17.8</td>
<td>37.4</td>
<td>13.1</td>
<td>1.9</td>
</tr>
<tr>
<td>3</td>
<td>8.3</td>
<td>23.0</td>
<td>28.3</td>
<td>23.1</td>
<td>14.7</td>
<td>2.6</td>
</tr>
</tbody>
</table>
There was a significant correlation between time-based tertiles and the highest educational qualification of participants of the reader survey (Table 10).

**Table 10: What is your highest educational qualification? \( (p = 0.036) \).**

<table>
<thead>
<tr>
<th>Tertile</th>
<th>PhD</th>
<th>Post graduate</th>
<th>Under graduate</th>
<th>Secondary School</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4.5</td>
<td>43.3</td>
<td>34.3</td>
<td>17.9</td>
</tr>
<tr>
<td>2</td>
<td>8.8</td>
<td>29.8</td>
<td>42.1</td>
<td>19.3</td>
</tr>
<tr>
<td>3</td>
<td>3.9</td>
<td>33.1</td>
<td>36.8</td>
<td>26.2</td>
</tr>
</tbody>
</table>

There was a significant correlation between the time-based tertiles and reader region of residence (Table 11). This reflected an increase in the number of participants from the Americas and Europe in the late responders group (tertile 3).

**Table 11: What is your country of residence? \( (p < 0.0001) \).**

<table>
<thead>
<tr>
<th>Tertile</th>
<th>Americas</th>
<th>Oceania</th>
<th>Europe</th>
<th>Asia</th>
<th>Africa</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1.4</td>
<td>98.6</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>2</td>
<td>4.6</td>
<td>93.6</td>
<td>1.8</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>3</td>
<td>52.9</td>
<td>23.3</td>
<td>21</td>
<td>1.5</td>
<td>1.3</td>
</tr>
</tbody>
</table>
6 Chapter Six: Discussion

The research in this thesis involved three discrete strands – the case study of Ngaio Marsh, the author survey, and the reader survey. Each component is first discussed separately, and then how these components interrelate with each other and the literature will be examined in the general discussion before drawing overall conclusions.

6.1 Discussion of the case study of Ngaio Marsh

The case study of Ngaio Marsh discussed three study propositions: that Ngaio Marsh cared about ensuring accuracy in her novels; undertook thorough research for her novels; and was aware of the potential flow-on effects of providing forensic science in her novels. The evidence presented in the case study supported the study propositions and demonstrated that she not only cared about the accuracy of the science in her novels, but also that she set them into the broader social context of the day. Her novels were contemporary, and reflected international events and associated issues of the time, e.g. World War II.

Marsh’s ensuring accuracy, her concern at readers finding errors in her work, and her anxiety at the potential for copycat crime provided a historical viewpoint to contextualise and inform the author survey, and provide an opportunity to compare the attitude of historic and current day crime writers in the communication of science. The results of the author survey mirrored the findings of the case study, indicating the modern day author shared the same desire for accuracy, awareness of flow-on effects, and sense of obligation to provide accurate information for their readers.

Marsh’s anxiety about the potential for copycat crime was expressed in the dialogue of some of her novels. Modern day authors did not seem to share Marsh’s concern for copycat crime or perpetrators learning how to avoid detection from reading their works. A number of contemporary
authors surveyed commented that one of the reasons they were not concerned was due to the wide availability of information on the Internet. They felt that if someone was compelled to look for information to perpetrate a crime, the Internet would be their first search point, rather than a work of fiction. Commercial and private access to the Internet did not begin until the late 1980s, after the time of Ngaio Marsh. Therefore, during the time of Marsh’s writing career, information about forensic science or methods of killing individuals was not as readily accessible to the general public. Fiction was a prominent form of mass media and may have been a potential source of knowledge or inspiration to perpetrate crime. This was particularly so for best-selling authors such as Marsh and her contemporaries. Marsh appeared to carry a sense of responsibility and concern that her works could inspire criminal activity.

One of the purposes of identifying the forensic techniques used by Marsh (Appendix 2), was to investigate if she incorporated new forensic technologies into her novels as they emerged over the fifty-year period she was writing. This would allow a discussion of Marsh’s attitude toward research and technical accuracy over the span of her writing career. The now standard forensic technique of DNA profiling was first admitted into court in 1986 (Jobling and Gill 2004). Therefore, all of Marsh’s works were pre-DNA. Marsh incorporated many forensic techniques into her work, including fingerprints and photography, blood and chemical analysis, ballistics, and forensic psychology. These were accurate to the time, but the procedures involved were not described in detail to the reader. Overall, she tended to rely on photography and fingerprinting, along with standard forensic techniques. She did on occasion make note of specialist techniques, such as specific ways of developing fingerprints on documents using silver nitrate solution, or iodine, or specific scientific tests, such as the Marsh – Berzelius test for arsenic. Apart from a reference to the then relatively new use of infrared spectography in Death at the Dolphin, there is little indication Marsh actively sought to include the latest forensic technologies in her works.

Marsh did incorporate more unusual science into her novels, such as the use of fish scale growth patterns to identify a specific specimen. She
appeared to enjoy using uncommon science to add a different dimension to her work. This may have been influenced by her contemporaries, such as Agatha Christie, including scientific and forensic content in their works. Although forensic science advanced in the fifty-year period Marsh was writing, she tended to stay with her standard forensic techniques mentioned above, particularly in her later years.

### 6.1.1 Methods of the case study of Ngaio Marsh

The case study of Ngaio Marsh involved reading the thirty-two Detective Chief Inspector Alleyn novels in print form and identifying forensic techniques used in her fiction (Appendix 2). Another method of undertaking this search could have been to access digital versions of the novels and keyword search for forensic techniques. Marsh did not always use the exact terms to describe these techniques. For example, instead of referring to ‘fingerprinting’, she often referred to bringing in her ‘flash and dabs’ men (Marsh 1959, Drayton 2008), or used the names of the characters who undertook those techniques. Keyword searching would have needed to incorporate her variations. Keyword searching digital editions would have provided incidence and frequency data for the forensic science, but would not provide the greater context of the use of that science to advance the plot, and also within the novel’s broader socio-political setting.

### 6.2 Discussion of the results of the author survey

The purpose of undertaking the author survey was to explore writers’ attitudes to the science they included in their crime fiction. This would then take into consideration the creator’s perspective when addressing the thesis question of what attitudes do writers of crime fiction have about the accuracy of science in their fiction and how that relates to the communication of science through crime fiction. A search of the literature found no examples of authors of print fiction being questioned about the science they included in their works, therefore the results of this research
is novel, and adds to the body of research in science communication. This work is the first to survey authors in the field of crime fiction for their beliefs and attitudes to forensic science.

The author survey was divided into two thematic groups of questions – those pertaining to the attitude of authors to the science they included in their fiction, and then questions relating to the potential flow-on effects of providing that science, e.g. copycat crime. The arguments that follow take into account the quantitative data gained from the Likert-type scale responses to the survey statements, as well as the qualitative data provided by thematic analysis of the open text boxes, and the authors’ individual comments.

### 6.2.1 Accuracy of the science included in crime fiction

The majority of authors included science in their novels and believed that readers expected a degree of forensic science in crime fiction. This expectation was driven by a number of factors. The popularity of forensic science based television series such as CSI: Crime Scene Investigation had caused authors to feel pressure to include scientific content in their work. The success of high profile, best-selling authors such as Patricia Cornwell and Kathy Reichs, whose crime fiction revolved around a central character who was an expert in forensic science, also contributed to authors’ sense of reader expectation. Authors tended to read in their genres for research and enjoyment, therefore their personal expectations and preferences as viewers of film or television and readers of crime fiction may have influenced their perception of pressure to include forensic science in their own works.

Of those authors who did include forensic science in their fiction, many placed the caveat on their inclusion of science as being dependent upon the context of the story. Some of those who commented in the open text boxes explained that as their work was historic, forensic science as a discipline did not exist. Others had protagonists who were amateur detectives and therefore did not have specialist knowledge or access to
forensic resources. Some had purposefully taken this strategy to avoid having to include modern day science. This may have been to negate the need for extensive research, and to also reduce the possibility of making errors and damaging their credibility to their readers. Conversely, some authors who had a high level of knowledge of forensic science because of their occupational background chose to include it, in the manner of Cornwell and Reichs who were experts in their field.

The majority of authors thought readers believed the science they read in crime fiction. As well as increasing reader expectation, some authors stated that television shows such as CSI had increased reader knowledge of forensic science. Cole and Dioso Villa listed a Producer Effect as one of the CSI Effects found in media accounts (Table 1). A producer effect was defined as jurors knowing more science as a result of watching CSI (Cole and Dioso-Villa 2009). This could be extrapolated to any viewer of CSI knowing more science as a result of watching the programme. With this increased knowledge these authors felt readers would therefore be able to recognise errors if they encountered them. This was one of the drivers to authors wanting to ensure the science they included in their crime fiction was accurate. A lesser number of authors agreed that readers believed the accuracy of science in crime novels more than that portrayed in CSI-type programmes. This statement attracted a similar number of neutral respondents, a number of whom commented that viewers were likely to be skeptical of elements depicted such as DNA results coming back within hours. Perhaps some authors felt uncomfortable being asked to place themselves into readers’ shoes and pass judgment on the veracity of television fiction versus that of print fiction, hence opting for a neutral response.

Authors were far more definitive in their responses to statements regarding the accuracy of the science they included in their fiction, with the majority of authors always ensuring the science was correct and undertaking thorough research to do so. Research methods were varied, but use of the Internet as a research tool was the predominant approach. This suggests the authors trusted the reliability of the Internet as a source of information, although some stated they used it as a starting point for
research, or read academic articles. A search of the literature on the accuracy of science on the Internet revealed most research on the topic pertained to the field of health information, and that although information was often variable, first stop sites such as Wikipedia were found to be narrow in scope and had more errors of omission rather than factual errors (Fallis and Fricke 2002, Clausin et al. 2008). Authors also relied on the information given by experts in the field, with many stating they talked with police, scientists or forensic experts. This is consistent with the approach taken by Ngaio Marsh, and by discussing science with expert practitioners, it would give the author opportunity to ask specific information relating to the scenario they had created for their story, rather than having to interpret how the science could be used after reading material about it.

When asked if authors would include slightly erroneous information in their works if it advanced the story, the minority that would stated that on those occasions they did not include incorrect factual information, but rather situational, such as the compression of the time it took for DNA testing results to come back to their protagonists. This corresponded with comments made in the earlier question if authors thought that readers believed the science they read in crime fiction more than that portrayed in television, where compression of time was also stated as being the primary inaccuracy that was deemed acceptable. This reflected the findings of Cole whereby the public generally recognised that the time taken to process DNA tests on CSI was unrealistic, and accelerated for television to push the story forward (Cole 2013). Hence this could be considered an acceptable lie.

Most authors stated they would not include erroneous information, and the correlation data indicated that those who agreed with the statements regarding ensuring their work was accurate and feeling an ethical obligation to do so were likely to disagree with the statement that they would include factual errors to advance the story (Table 3, p<0.05). This statistical finding was expected and logical, as purposefully misleading readers with wrong information would be contrary to the principles of the ethically minded author. When discussing the use of narrative to
communicate science, Dahlstrom and Ho suggested three ethical considerations. One of those was what were the appropriate levels of accuracy to maintain within the narrative, and that as narrative was context dependent, then some alterations in accuracy may be appropriate (Dahlstrom and Ho 2012) The authors recognised that the context of fiction gave them a certain license to stretch the truth, but overall accuracy was important to them.

The majority of authors were concerned that if they made factual errors in their work, the errors would be pointed out by readers. Those that were not concerned commented that they wrote fiction, and readers entered into the reading of their work in the knowledge it was fictional and therefore not obliged to be truthful. In contrast, a number of the authors that commented on readers discovering errors took the more encompassing view that if readers discovered factual errors in their work it would diminish their faith in the novel as a whole, including the characters and plot and that it would break the trust between author and reader.

Providing accurate scientific information in their fiction was important to authors for numerous reasons, from a professional and personal need for accuracy, to a fear of having errors discovered by readers. The majority of writers also felt an ethical obligation to include accurate forensic science in their works. If readers believed the science that was included in their print fiction, it was the author’s responsibility to provide correct information and they would undertake the research to do so. Despite the platform of their work being fiction, where licence is given to making up characters, situations, and story, authors still felt they had to be truthful.

6.2.2 The flow-on effects of providing scientific information in fiction

Authors’ attitudes to the potential flow-on effects of providing scientific content in their work was in contrast to their concerns about accuracy. Whereas the majority of authors ensured correct scientific information
was given in their works, very few were concerned about the potential flow-on effects of providing it, such as copycat crime, or the potential for criminals to learn how to avoid leaving behind forensic evidence. This was unexpected, as many authors had indicated their anxiety at having readers discover errors in their work, it therefore could be suggested they may also have concern about copycat crime, and the potential for harm. This was not the case. As some pointed out, their understanding of the readership of crime fiction was that it tended to be middle aged women who were unlikely to be involved in crime. Others indicated that their works were often inspired by real life crimes that had already occurred, and that the inverse was not true. Frequently cited was the knowledge that most of the information they included was readily available on the Internet, a source the authors themselves frequently used.

Those that did feel a level of anxiety about copycat crime indicated they had purposefully withheld some information to reduce the potential for it occurring. None of the authors were aware of copycat crime occurring as a result of their works.

Further research could be undertaken to investigate whether authors’ attitudes towards copycat crime changed in relation to where they were in their career, and if anxiety about the potential for copycat crime was something that occurred only in early career writers. Ngaio Marsh’s allusions to criminals getting ‘the big idea’ from fiction occurred in her earlier works of fiction, and then subsided as her career advanced. Those authors who were not concerned about copycat crime may have had several novels published, and come to the realisation no copycat crime had occurred as a result of their work, and it was highly unlikely that it would. Also, first time or early career writers may have an over-optimistic concept of the reach of their works, whereas mid and late-career writers would realise that readerships are small, and there was little likelihood of one of that small number of readers using the examples in their work as the basis to undertake a criminal act.
6.2.3 Demographic information of authors

Over 90% of the respondents to the author survey were female. This high proportion of female writers reflected the number of respondents from the Sisters in Crime organisation who actively promoted the survey to their members via email and social media. Sisters in Crime is an Australian crime writers association for women, founded in 1991 (Sisters in Crime 2016). The organisation has 500 members. As this was an anonymous survey, the exact number of respondents from this group cannot be ascertained, but 16 responses from Australia were observed directly after the survey link was shared by the organisation to its members, and a further ten over subsequent days. Similarly, when asked about their country of residence, 70% of respondents recorded ‘Australia’. It became apparent during the time period the survey was open that the ratio of female to male respondents was going to be weighted heavily to female. In order to offset the disparity in gender, individual male crime writers were invited via email to participate in the survey. This increased the number of male respondents by one. Therefore a limitation of the writer’s survey is that due to its high proportion of female respondents it is not representative of all crime writers.

The majority of authors (86.5%) were aged between 40 and 69 years and there were no respondents younger than thirty years of age. For comparison, a search for information on the average age of novelists in the literature yielded no results. The writers’ organisation The New Zealand Society of Authors (NZSA) was approached to enquire after age data of writers, but they did not collect demographic information from their members. In a small survey undertaken by Hines, (247 respondents) the average age for publication of a first novel for a writer was 37 years. Although Hines’ survey was informal, it supports the data collected in this survey, that the majority of fiction writers were over 40 years of age (Hines 2010).

The respondents to the author survey were well educated, with half having a postgraduate qualification. Sadler argued individuals with a tertiary education were more likely to participate in research as they
realised the value of research and were more likely to respond to invitations to participate (Sadler et al. 2010). The demographic information on education collected in the reader survey supported these findings.

In conclusion, the majority of authors ensured they undertook thorough research to ensure the science they included in their fiction was accurate. They felt an ethical obligation to do so, and were aware that errors in their fiction would break trust with their readers. Authors were aware of the potential flow-on effects of providing forensic science in their work, but the majority were not concerned that copycat crime would result from it.
6.3 Discussion of the results of the reader survey

The purpose of undertaking the reader survey was to explore readers’ attitudes to the science they encountered in crime fiction. This would then take into consideration the end user’s perspective when addressing the thesis question of do readers of crime fiction place value on scientific accuracy, and how that impacts whether science can be communicated through crime fiction. This discussion will consider the results of the reader survey in its own right. How the reader survey thread of this thesis interrelates with the author survey and Ngaio Marsh case study, and how they answer the thesis question will be argued in the summary discussion in Chapter Six. As with the author survey, a search of the literature found no examples of readers of print fiction being questioned about their attitude towards the science they encountered in crime fiction, or fiction in general, therefore the results of this research is novel and will add to the body of research in science communication.

6.3.1 Readers’ responses to survey statements

Science has become an integral part of crime fiction, and the readers surveyed endorsed this by stating they liked to read crime fiction that included forensic science, and that its inclusion made the novels more believable. The majority of readers indicated they were interested in the forensic science in crime fiction and liked to learn something new and interesting. The question of learning forensic science through fiction was posed in two ways; readers were asked to indicate if they liked to learn some interesting forensic science when they read crime fiction; and then if they expected to learn some forensic science. The readers’ response to the latter statement was only 50% positive, compared to 80% liking to learn, which indicated readers recognised that crime fiction was a form of entertainment, and any incidental learning was a welcome addition rather than an expectation. This reflected Sheldrick Ross’s description of readers finding information without seeking, and that although they read books
for the pleasure of it, they enjoyed finding information that was helpful or interesting (Sheldrick Ross 1999).

Despite the recognition that crime fiction was a form of entertainment, the majority of readers stated it was important to them that the science incorporated into the novel was true and accurate (87%). This was highlighted by two underlying themes identified from the open text boxes that were predominant across all of the statements posed to the readers; the science had to fit into the context of the story; and that the science must be accurate. Comments made pertaining to the accuracy of the science in fiction echoed a theme expressed in the authors’ survey, that inaccurate science broke the reader’s trust in the author, and that diminished the reader’s belief in all aspects of the novel, not just the science, reducing reader enjoyment and making them wary of future offerings from that author.

The readers’ expectations of crime fiction containing interesting forensic science they could learn about, and how that information must be accurate, illustrates the potential importance of crime fiction as a vehicle for science communication, even if as a secondary effect to entertainment. It also challenges the conclusions of Marsh et al. who surmised that in learning from fiction, readers may be less critical in their assessment of what was factual than learning from other sources (Marsh, Meade, and Roediger III 2003).

The other major theme that emerged across all statements and particularly with the statement “I believe that the forensic science in crime fiction is true and accurate,” was that the level of belief depended on the author. Less than half of the readers agreed with the statement, and over a third gave a neutral response. Of those who responded neutrally, many wrote the qualifier it depends on the author and a number of those also cited the name of Patricia Cornwell as an author they trusted. The same theme emerged when readers were asked if they believed writers took care to ensure the forensic science they included in their fiction was true and accurate. Therefore, when asked to name authors they did trust, an overwhelming number of readers named Patricia Cornwell, and also
Kathy Reichs, two writers known to be experts in their fields as a medical examiner, and forensic anthropologist respectively.

There are two elements that could have contributed to readers having greater confidence in the veracity of the science in the works of Cornwell and Reichs. The first is prior knowledge of the professional backgrounds of the authors. Author biographies in their novels, as well as those on their websites and provided as part of reviews and journalistic articles clearly identify the authors’ scientific background and credentials. Kathy Reich’s Temperance Brennan books have been successfully adapted as a television series. They are both writers with a high output of work, and are regularly on the best-seller lists provided by the book industry, so they are constantly in the public eye.

The second element is the effect of publicity and profile. Patricia Cornwell and Kathy Reichs’ books are well publicised by their international publishers and feature on the best-seller lists, as do the titles of the other most regularly cited authors in the survey, such as James Patterson, Tess Gerritsen, Jeffrey Deaver, Karen Slaughter, Michael Connelly and Ian Rankin. These authors have also had successful film and television adaptations made of their works. As they are successful authors, both for the publishers and bookstore retailers, their books are always in print, well stocked and displayed, thus perpetuating their ability to sell and be on the best-sellers lists. Their books are reviewed and receive column space in newspapers and magazines alike. The challenge for lesser-known authors to gain reader’s trust is to reach readers at all. Authors from smaller countries were disadvantaged when it came to readers being able to name authors they could trust, as were authors not considered to be commercial certainties by their publishers and retailers. This was demonstrated by the long tail in responses to the question in the survey, where there were 149 instances of an author being endorsed once, out of 233 authors cited.

Higher publicity and visibility leading to name recognition and sales was also reflected in the table of authors whom readers did not trust to provide true and accurate science in their novels, with three of the authors, James
Patterson, Patricia Cornwall, and Jeffery Deaver appearing in both lists. Why would authors be on both lists? Perhaps some readers viewed popularity and appearing in best-sellers lists with a degree of scepticism. They may have considered authors who were best-sellers might be less stringent about accuracy in their novels as they were guaranteed to sell large quantities, regardless. Frequency of publications may have also played a role. When naming authors they did not trust, two responders commented about James Patterson – “James Patterson – how could someone possibly investigate forensic science enough and then produce 10 novels a year?” and “James Patterson – but I have no evidence to suggest his novels are inaccurate, they merely seem more lightweight and therefore less reliable.” All of the top ten non-trusted authors were novelists who were best-sellers, and again, many had successful film or television adaptations made of their works.

The growth of the use of forensic science in television series, such as CSI: Crime Scene Investigation, had increased readers’ expectation that forensic science would also be included in the crime fiction they read in novels. Comments from readers included that they liked to learn about forensic science, which reinforced the data from earlier survey statements that readers liked to learn some interesting forensic science. A theme that emerged from the statement that watching CSI type programmes had increased reader expectation on writers was that viewers recognised CSI was not real, and did not consider it an accurate depiction of the day to day operations and time scales of law enforcement. This result was reflected in the following statement, which indicated readers believed the accuracy of science written in a novel more than the accuracy of the science they saw in CSI type programmes. The advantage novelists had in the length of time they had to research and write their work, compared to the quick turnaround times required by screen writers was mentioned by a number of readers. This was also reflected in the comments made by authors when they were asked if they thought readers trusted the work of print authors more than television.

Readers of crime fiction indicated that the accuracy of the science included in crime fiction was important to them. They liked to learn
interesting science while reading crime fiction, but it had to be in the context of the novel and relevant to the story. Reader’s belief that the science they read in crime fiction was true and accurate was to some extent dependent on the author, and their trust in that author.

6.3.2 Reader survey methods

The online reader survey was distributed using snowball sampling methods by seeding from email databases or by social media. A number of the large databases approached to send out the link either did not respond, or declined. Some that permitted the survey link had a surprisingly low rate of uptake. For example, the Goodreads Mystery Group had over ten thousand subscribers. Permission was sought from the moderators and a link provided to the survey through their “In the Press, Blogs, and Sites” folder. There were only five respondents that corresponded to the date of initial seeding. One reason for the low number may be the large number of different threads the group operates, so when notifications went to members the survey link was lost within five pages of thread updates.

The transient nature of social media and its information on a continuously updating scrolling feed platform, such as Facebook and Twitter may have been an impediment. The link would be shared, but as the notifications page updates and older posts scrolled down the page, if people did not see the information and follow the link and complete the survey immediately, they may have forgotten about it, or been unable to find it again. On Facebook, readers would also be dependent on Facebook’s algorithms and automatic selection of whose news feed updates appear on any one user’s homepage. This is one of the negatives to snowball sampling through social media platforms. It is immediate and impulsive. The higher strike rate appeared to be through databases that provided an email with the link to the survey. This is an observation based on analysis of the time correlation between the emailing out of the link and the numbers of responses on the Survey Monkey website. The large surge of respondents towards the end of the survey period did not correspond to
any direct email or social media seeding, and therefore was likely to have been a result of the survey link being forwarded or shared to a large group or forum.

Due to the late surge in survey respondent numbers, the respondents were divided into time-based tertiles to give opportunity to investigate any differences in responses between early, mid and late responders. The division of the data into thirds was chosen to ensure all of the respondents from the August spike were in the same group. Correlations between the time-based tertiles and the survey statement responses were for the most part significant, indicating trends existed in the participant’s responses depending on the time of recruitment to the study. There were instances where those significant findings were expected, for example in country of residence, as the region of residence of the majority of respondents in the later responder group was America.

Was comparing the time-based tertiles and participant responses valid in a snowball sampling method? Literature relating the effects of early versus late responders concentrated on the more traditional methods of surveying, postal and telephone surveys, where participants were approached to respond on multiple occasions (Lin and Schaeffer 1995, Porter and Whitcomb 2005). In snowball sampling, the link is shared from responder to responder over a period of time. When a secondary or tertiary responder completes the survey, it is likely to be at their first exposure to it, therefore their motivation could be different to traditional survey method respondents who may have received the survey, but taken their time to respond, for whatever reason, e.g. reluctance or resistance. With an increasing number of surveys being web-based, and snowball sampling increasing in use, this is an area for future research.

Compared to the author survey, more correlations between the reader survey statements tended to be significant. The high proportion of significant returns may be attributed to the large sample size of the reader survey, and therefore the lower t-statistic for the 95% confidence interval. Lindley calls the effect of sample size on significance a statistical paradox (Lindley 1957). Using a similar argument, Berger and Sellke caution
against assuming that a small $p$-value is strong evidence against a null hypothesis. This is to be taken into consideration when drawing conclusions from the correlations in the reader survey.

### 6.3.3 Sources of bias

The use of online survey platforms resulted in inherent bias including accessibility as discussed earlier. Online surveying may exclude a socioeconomic group that does not have ready access to a computer. That group may include potential crime fiction readers who have access to free library services and therefore book resources, but were not likely to be reached by electronic recruiting. Older readers who do not regularly use computer technology but who are avid readers of fiction may also have been missed, and therefore be under-represented.

Snowball sampling methods can introduce demographic bias. The nature of snowball sampling is such that individuals will tend to pass on the link to their peers who are likely to be of a similar socio-economic group, and similar educational background (Sadler et al. 2010). By targeting organisations that had a specific interest in crime fiction as first level contacts for snowball sampling, the demographic make-up of those organisations could be reflected disproportionately in the results. For example, LIANZA, an organisation of librarians, distributed the survey link, meaning a high response rate from members of that organisation had the potential to skew the demographic occupation proportions of librarians. Similarly, a number of first level contacts were within departments in universities, which had potential to indicate a higher proportion of tertiary educated respondents in the results. Sadler also proposed that people with higher education levels were more likely to participate in research as they realised the value of research and were more likely to respond to invitations to participate (Sadler et al. 2010).

To avoid potential bias created by having the crime fiction writer researcher’s name associated with the survey, the survey information was sent out under the umbrella of the Centre for Science Communication,
initially, with the primary supervisor listed as the corresponding researcher and then the School of Pharmacy. This reduced the potential for respondents to answer in the way they thought the researcher might like them to answer, instead of giving their true opinions. Despite the precautions undertaken to avoid disclosing the identity of the researcher, there were a number of respondents who were aware of whom the primary researcher was, which may have influenced their responses.

6.4 General discussion

Research in this thesis explored how science can be communicated informally through fictional media. It did this by using mixed methods research, combining the contextual and descriptive elements of a case study, with the quantitative and qualitative data collected from two surveys, one directed at the users of fiction - the readers, and the other directed at the creators of fiction – the writers. The case study of Ngaio Marsh informed the questions presented in the reader and writer surveys.

A search of the literature did not reveal any prior research into the attitudes of writers of crime fiction to the science they incorporated into their novels. Nor was there evidence of research into the attitudes of readers of crime fiction novels to the science they encountered in their fiction. Therefore this research contributes new information to the body of knowledge around the communication of science.

The writer and reader surveys highlighted the perceptions of readers to the science they encountered in crime fiction, and the attitudes of writers to the science content they included in their works. Narrative is a very persuasive form of communication, and how science is represented in fiction, from the images it portrays of scientists, to the effects it can have on the criminal justice system, can impact upon people’s beliefs and perceptions of science (Orthia et al. 2012). This impact can be negative,

---

1 Lead supervision and department for this PhD was initially based at the Centre for Science Communication until the retirement of the primary supervisor. Supervision and department then transferred to the School of Pharmacy.
such as the reinforcement of the mad scientist image of researchers (Weingart and Pansegrau 2003), or by reducing the integrity and trust of science by being inaccurate, incorrect, or highlighting bad science and errors (Orthia et al. 2012). Respondents of the reader survey indicated that accuracy of science in the fiction they read was important to many of them, and that inaccurate or incorrect science caused some of them to lose faith in the author and the story, and diminished their reader experience.

The television drama CSI: Crime Scene Investigation first aired in the USA in 2000 (Cannon 2000). Its use of digital special effects and cutting edge forensic science captured the public imagination. It is a prominent example of the potential detrimental impact of fictional portrayals on society, so much so the term ‘CSI Effect’ was coined to describe the phenomenon of an unrealistic expectation that police forensic laboratories could do everything portrayed on television (Kluger 2002). This term was expanded to include several other effects that impacted on the criminal justice system (Cole and Dioso-Villa 2009). There has been debate in media, academic and legal circles about the CSI Effect and its impact, both negative and positive (Shelton, Kim, and Barak 2009, Podlas 2006, Hughes and Magers 2007, Harvey and Derksen 2009). The advent of new visual media had elicited social commentary and criticism in the past. Ngaio Marsh referred in her novels to “the talkies” or talking films influencing youth to turn to criminal behavior. There was much public debate over the effects of this new media technology when it emerged in the 1920s with concern that it would educate criminals and that it glamorised mob behavior (Vaughn 2005).

Did the advent of CSI-type programming, relying on a high level of forensic science, have an impact on expectations of crime fiction readers, and did it therefore place pressure on writers of crime fiction to include forensic science in their novels? Survey data indicated writers did feel pressure to include forensic science in their work as a result of CSI-type programmes. Likewise, almost half of readers indicated an increased expectation of forensic science content in written fiction as a result of watching CSI-type programmes on television.
The veracity of written media over that of television was explored by asking if readers believed the science they read in fiction, more than that which they viewed on television. More than half of the reader respondents agreed that the accuracy of science presented in novels was greater than the accuracy of science portrayed in television. The highly visual and often exaggerated elements of television fiction may therefore be seen as being designed to entertain, and perceived to be less truthful than the written word. Respondents in the reader survey recognised some elements stretched the truth, but were accepting of it. This supported the conclusions of Marsh et al. when investigating how readers incorporated knowledge learned from fiction into their general knowledge. They stated fiction was an unusual source as readers knowing that a piece of information came from a fictional source, did not necessarily think it was wrong (Marsh, Meade, and Roediger III 2003).

From the creator/author perspective it also supported the findings of Kirby, when interviewing writers and producers of television fictional crime drama, where the creators of the dramas had a flexible view on scientific realism, where simplifying or exaggerating elements to fit into the format of a television time frame was not the same as being inaccurate (Kirby 2013).

When writers were asked if they thought readers believed the science presented in print fiction more than that portrayed in CSI-type television, 43% of writers agreed, but a similar percentage were neutral. The question asked writers to project themselves into the mind of readers, so their responses likely reflected their personal beliefs as both readers and writers, and possibly also a reluctance to rate themselves as a better source of information than television. The common theme between both readers and writers was that the most obvious difference between reality and that presented by CSI type programming was the compression of time with respect to the return of DNA analysis from the laboratory. This was also the element where authors felt they could include slightly incorrect information if it advanced the story. It was seen to be an acceptable deception. This belief was mirrored by acceptance from readers that they
were reading fiction, and that time compression was necessary to advance the plot.

Once they leave school, the general public gets the majority of its scientific content from forms of mass media, whether this be from television, film or the Internet (Dahlstrom 2014). These sources are one of many channels of information that inform life-long learning, and how this information is used by a person is influenced by many factors, particularly identity, incorporating the individual’s life stage, needs, social environment, attitudes and beliefs (Longnecker 2016). Most of these sources rely on a narrative format to convey their information. This can be purely fictional, e.g. television drama; or news and documentary features that offer human impact stories and anecdotes to personify their message and engage with their audience. Dahlstrom and Ho concluded that information conveyed through narrative increased reader engagement, and as well as increasing knowledge, could also influence beliefs. Popular fiction, and in particular crime fiction with its use of forensic science in the course of the investigation of a crime, can have some impact as a source of scientific information. This places a weight of responsibility on authors to communicate science accurately, but it also offers opportunities for authors to include science in their fiction within the context of the story to entertain and potentially impart new knowledge to the reader. The responses from reader survey indicated they enjoyed learning new scientific content in crime fiction if it enhanced the story.

Television is a form of mass media that is readily accessible, and the science that is communicated through the medium, whether truthful or not, reaches a large audience. Television was in its infancy at the start of Ngaio Marsh’s writing career, and print media, such as newspapers and fiction were more predominant as forms of mass communication. Therefore, best-selling authors of that age, such as Marsh and Agatha Christie, were influential as the scientific content of their work reached a wide readership. The evidence gathered in the case study of Ngaio Marsh indicated she strove for accuracy in the science she presented, and was aware of the flow-on effects of that science to readers. As well as her professionalism and not wanting to have readers point out errors, an
awareness of her influence as a creator of mass media may have influenced her attitude towards accuracy. In today’s highly digital environment, with its predominance of visual media and the accessibility of the Internet, the influence of print media, and in particular crime fiction as a source of forensic information, may have diminished across the entire population, and therefore the influence of the modern day crime writer as a form of mass media communication may be less than that of earlier writers such as Marsh. Future study of the influence of different forms of popular mass media could inform the field of science communication of potential avenues for reaching an audience.

The presentation of science in crime fiction did have an impact on readers surveyed. The majority of readers enjoyed reading crime fiction that included forensic science, and many expected it and liked to learn about it through fiction. In his introduction to a selection of papers in the Public Understanding of Science, focusing on the representation of science and scientists in popular culture, Weingart argued that the public’s perceptions of science and scientists are influenced more by fictional representations, than by real people (Weingart and Pansegrau 2003). This has implications for the communication of science through fiction.

Narrative communication differs from logic-based scientific communication as it is contextualised within a framework of experience and ongoing cause and effect. Narrative expressed itself through the subjective view of an individual’s experience, therefore people judged the legitimacy of the information it contained on the overall situation (Schank and Abelson 1995). Both authors and readers acknowledged that the science communicated in fiction had to fit into the context of the story and this context may require some adjustment to the truth, e.g. the compression of time scales in DNA analysis. There was a mutual acceptance of the need for modification of the truth. This recognition of context was also evident in the works of Ngaio Marsh, where the science communicated was also often embedded in the social context of the day, e.g. the science of eugenics and heredity insanity discussed in The Nursing Home Murder, or epilepsy and medical competency as discussed in Off with His Head. Marsh recognised the importance of communicating
science within a broader social setting to make a social or political commentary. This showed a self-awareness from Marsh of the weight of responsibility bestowed upon a writer, and again reflected Dahlstrom and Ho’s conclusion that as well as increasing knowledge, narrative could influence beliefs.

The results of the present study showed largely positive reader attitudes towards the forensic science they encountered in crime fiction. This was in contrast with much of the literature, particularly that surrounding the CSI Effect as discussed earlier, which concentrated on the negative perceptions and impacts of science portrayed in fiction across the media (Cole and Dioso-Villa 2006, Harvey and Derksen 2009). The majority of readers surveyed liked to read crime fiction that included forensic science, and found novels that contained forensic science more believable. Accuracy was important to readers, and most believed that writers of crime fiction provided correct information. However, when asked if they believed the science in crime fiction was true and accurate, just under half of the respondents agreed, and 40% of respondents were neutral, indicating they were not sure or were not prepared to speculate. The high educational levels of reader survey respondents may indicate their ability to recognise when the science they encountered in fiction was questionable or incorrect, their ability to understand it, and to make a considered judgment on whether writers did provide accurate information.

Many writers gave a neutral response to the statements ‘readers expect crime fiction novels to contain forensic science,’ and ‘readers take crime fiction that contains forensic science more seriously.’ This may have reflected an unwillingness to speculate on the attitudes of readers. The high degree of writer uncertainty was not evident when writers were asked to respond to the statement ‘readers believe the science they read in crime fiction is true and accurate.’ For this statement, three quarters of writers agreed. Perhaps writers had greater confidence in readers trusting them to provide accurate scientific information. This trust may have been generated by the writer’s own personal commitment to providing accurate information, with 90% of writers indicating they always ensured
the science they included in their fiction was correct, and three quarters saying they liked to thoroughly research the science they used in fiction. Modern day writers’ professional and personal need to provide accurate information reflected the historic striving for accuracy displayed by Ngaio Marsh. This was driven by her own high standards, and also by a fear of disappointing readers by presenting errors, or as she called them, ‘bloomers’ (Harding 2015). Inaccurate science was perceived as breaking the trust that formed between readers and writers, and if this trust was broken by providing inaccurate science, then it caused the reader to doubt all elements of the author’s work. Reader expectation acted as a driver for writers to research and to provide accurate information.

A major theme that emerged from this research was that readers’ level of belief in the accuracy of science in their fiction was dependent on the author. Writers with a professional background in science, e.g. Patricia Cornwall and Kathy Reichs, were considered to be most trustworthy. This reflected to some extent the findings of Hovland and Weiss on the effects of source credibility, where there was immediate acceptance of information given by a high credibility source, although in the context of their study in a assessment situation, this effect diminished over time (Hovland and Weiss 1951). Readers had a tendency to go back to authors they enjoyed and trusted. When considering the potential for science communication through crime fiction, this research indicates writers and publishers should take into account the reader’s perception of the writer’s qualifications to do so, and their trustworthiness. The majority of writers in the survey indicated they strove for accuracy and felt an ethical obligation to provide accurate scientific information. If popular fiction is to be considered as a vehicle for communicating science to the reading community, then writers, science communicators and the publishing industry need to consider how to convey authors’ trustworthiness to the readers.

Readers responded that they enjoyed learning new scientific information through crime fiction, and some indicated they expected to learn new and interesting facts. They were encourerers as described by Erdelez, who enjoyed discovering other topics of interest, or super encounterers who
actively employed incidental learning as part of their knowledge gathering (Erdelez 1999). This suggests that there is an opportunity for science communication to use popular fiction as a means of conveying information to the public. It can be argued the purpose of fiction is to entertain, and the purpose of science communication is to educate. Where can popular fiction and science communication meet? And should they? One of the questions posed by Dahlstrom and Ho, when considering the persuasiveness of narrative and examining the ethics of using it as a means of science communication was should narrative be used at all? (Dahlstrom and Ho 2012). Is there a place for active communication of science through popular fiction? Ogawa proposed a design approach to science communication which looked at the stakeholders intention in the context of the relationship between science and society. By looking at the intent of the stakeholders or scientists, it allowed for differences in values across that community (Ogawa 2012). Where authors are the stakeholders, what is their intent in communicating science in their novels? Authors surveyed in this research indicated their intent in including science in their novels was to use it in the context of the story, e.g. the police investigation of a crime, to enhance and advance the story, but importantly, the values set they placed upon the inclusion of the science was a professional and ethical obligation to ensure it was accurate and to keep trust with the reader. From the user perspective this research indicated readers enjoyed and were accepting of science in their fiction providing it was within the context of the story, and that it was accurate. There was a convergence of values between authors and readers of the expectation for accuracy in the science encountered in crime fiction, and therefore maintaining the trust between the two stakeholders. This supported the hypotheses it is important to readers that the science they encounter in novels is accurate, and that writers of crime fiction endeavor to ensure the science they include in their fiction is accurate.

Narrative is a powerful and persuasive way of imparting information. This thesis asked the questions do readers of crime fiction place value on scientific accuracy? and what attitudes do writers of crime fiction have about the accuracy of science in their fiction? By investigating these
questions it explored if science could be communicated through crime fiction? It examined the incidental acquisition of knowledge through a form of popular fiction by using the historic case study of Ngaio Marsh to give a historic perspective of communication in science, and to inform contemporary surveys examining the attitudes of authors and readers of crime fiction to the science included in novels. The results of the case study, and the reader and writer surveys indicate that science can be communicated through crime fiction, provided that it is accurate and within the context of the story.

6.4.1 Limitations of the research

The results from the reader survey and the writer survey are not representative of all readers and all writers. The demographics of the survey respondents were heavily Oceanic and American centric. Europe was less well represented by the respondents, but Asian and African readers and writers were poorly represented. The impact of cultural and societal differences on attitudes of readers to the science they encounter in fiction, and writers of crime fiction cannot be discounted, therefore the results of this research must be viewed within these limitations, and generalisations made with caution.

Likewise, the predominance of female respondents over male respondents in both the writer and reader surveys is a potential cause of bias and negates the ability to make generalisations across the entire writer population. The low participation rate of males reflected the findings of Smith, and Underwood et al, who found that the participation of males in surveys was lower than females irrespective of the survey method (Smith 2008, Underwood, Kim, and Matier 2000).

Sources of bias as discussed in the results of the reader survey must be considered. These related to the collection of data using an online surveying platform, therefore excluding a socioeconomic group that did not have ready access to a computer, and also older generation readers who had not embraced digital technology. The snowball sampling
The seeding mechanism of targeting groups and organisations with a specific interest in crime fiction reduced the opportunity for generalised readers to respond. Snowball sampling method also means participants tend to share the survey links to their friends and peers, who often share a similar socio-economic background and educational background. This can skew the data towards higher educated individuals.

6.4.2 Future research

When searching the literature for examples of research into the attitudes of writers and readers to the science they encountered in fiction, it became evident there had been little research conducted on this topic. During the course of this thesis a number of avenues for future research became apparent.

Research and discussion of the ethics of providing scientific information in a fictional product would add to the greater knowledge. This is an important discussion to have in the field of science communication, and also in the humanities. Writers and readers of crime fiction acknowledged that what they were reading was fiction, yet there was still an expectation that the science represented in fiction was true and accurate.

Writers of crime fiction displayed variability in their concern about the potential for copycat crime as a result of their crime fiction. The case study of Ngaio Marsh showed her concerns about copycat crime being expressed in the themes and text of her novels seemed to occur earlier in her career rather than later. A study of author concerns about the potential for copycat crime, and the author reaction to it i.e. withholding scientific information, correlated to where they were in their writing career would provide new information. Are authors concerned about copycat crime early in their careers, whereas mid and late career authors have had the time to realise copycat crime has not happened and is unlikely to, therefore their anxieties are allayed? Do writers who worry about copycat crime have an overinflated idea of the reach of their work?
The limitations of this research included a lack of representation of readers from Asia and Africa. It would be useful to extend the research demographics by surveying readers and writers from these regions to examine if their attitudes towards the science encountered in crime fiction mirrored that of the respondents to this study. Do cultural differences and their associated societal mores have an impact on readers’ expectations of accuracy and truth?

The snowball sampling method used in the distribution of the surveys raised many points. There was little literature on the use of snowball sampling and social media platforms. This study showed interesting data on the timing of survey returns. The reader survey had a slow start, and then a slow return rate over time until a pivotal date, when the number of responses jumped markedly. Research into snowball sampling in the digital environment and response rate, and the effect of a pivotal ‘share’ on response rate and demographics would add to the body of knowledge of a relatively new field. The spike in return rates enabled this study to compare the responses of early responders, mid-responders and late responders, but further research into the validity of these separations for digital snowball sampling compared to mail and telephone surveying is needed. Research into the use of snowball sampling on social media platforms would be helpful in survey design and method, especially as use of social media is expanding, and it is a valuable resource for reaching a population.

6.4.3 Conclusions

This study explored the research questions 1) Do readers of crime fiction place value on scientific accuracy? and 2) What attitudes do writers of crime fiction have about the accuracy of science in their fiction? By examining these questions it explored whether science could be communicated through crime fiction. It did this with a mixed methods approach using the combination of a historic case study of Ngaio Marsh to inform the questions and results of a survey of author attitudes to the science they included in their fiction, and a survey of the attitudes of
readers to the science they encountered reading crime fiction. The literature had shown narrative to be a powerful means of communicating science, and that this can have both positive and negative effects on society. This research found readers of crime fiction were receptive to learning interesting forensic science in their fiction, and many expected it as part of their reading experience. This was, however, contingent upon the scientific information being true and accurate, and relevant in the context of the story. The writers of crime fiction expressed a professional and ethical responsibility to provide accurate scientific information in their fiction, although some were wary of the potential for that information being used in the perpetration of a crime. Reader expectation that the science encountered in fiction was true and accurate, combined with writers’ sense of obligation to research thoroughly to provide accurate information demonstrated that science could be communicated through crime fiction.
References


Carter, William. 2013. "Email correspondence with Bill Carter."


Harding, Bruce. 2015. Interview with Bruce Harding. edited by Vanda Symon.


Smith, William G. 2008. "Does Gender Influence Online Survey Participation? A Record-linkage Analysis of University Faculty Online Survey Response Behavior.".


Trench, Brian. 2006. "Science Communication and Citizen Science: How Dead is the Deficit Model?" 9th International Conference on Public
Communication of Science and Technology (PCST) 17-19 May 2006, Seoul, South Korea.


Appendices
Appendix 1: Selected Bibliography of Ngaio Marsh (Harding 2016)

Novels

A Man Lay Dead (London 1934; New York 1942);

Enter A Murder (London, 1935; New York 1942);

The Nursing Home Murder with Henry Jellett (London 1935, New York, 1941);

Death in Ecstasy. (London: 1936; New York, 1941);

Vintage Murder (London: 1937; New York, 1940);

Artists in Crime (London and New York, 1938);

Death in a White Tie. (London and New York, 1938);

Overture to Death (London and New York, 1939);

Death at the Bar (London and Boston 1940);

Death of a Peer (Boston 1940; pub. as Surfeit of Lampreys. London, 1941);

Death and the Dancing Footman (Boston, 1941; London, 1942);

Colour Scheme (London and Boston, 1943);

Died in the Wool (Auckland, 1944; London and Boston,1945);

Final Curtain (London and Boston, 1947);

A Wreath for Rivera (Boston, 1949; pub. as Swing. Brother. Swing. London: 1949);

Night at the Vulcan (Boston, 1951; pub. as Opening Night, London, 1951);
“Spinsters in Jeopardy” (Boston, 1953; London, 1954; pub. as The Bride of Death, New York, 1955);

“Scales of Justice” (London and Boston, 1955);

“Death of a Fool” (Boston, 1956; pub. as Off with His Head. London, 1957);

“Singing in the Shrouds” (Boston, 1958; London, 1959);

“False Scent” (Boston and London, 1960);

“Hand in Glove” (Boston and London, 1962);

“Dead Water” (Boston, 1963; London, 1964);

“Killer Dolphin” (Boston, 1966; pub. as Death at the Dolphin (London, 1967);

“Clutch of Constables” (London, 1968; Boston 1969); “When in Rome” (London, 1970; Boston, 1971);

“Tied Up in Tinsel” (London, and Boston, 1972);

“Black as He’s Painted” (London and Boston, 1974);

“Last Ditch.” (Boston and London, 1977);

“Grave Mistake” (Boston and London, 1978);

“Photo Finish” (London, and Boston, 1980);

“Light Thickens.” (London and Boston, 1982).

**Short Fiction:**

“The Collected Short Fiction of Ngaio Marsh” (ed.) Douglas G. Greene, New York, 1989 (This volume contains seven known short stories by Ngaio Marsh, plus other short pieces.)

“The Figure Quoted” (1927); rpt. in (ed.) O.N. Gillespie, *New Zealand Short Stories* (London and Toronto, 1930), 209-218;

“Moonshine”; in (ed.) Warwick Lawrence, *Yours and Mine: Stories by Young New Zealanders* (New Plymouth, NZ, 1936), 21-29;

“Murder at Christmas”, (The Grand Magazine. December 1934); rpt. as


“Chapter and Verse: The Little Copplestone Mystery”, *Ellery Queen’s Mystery Magazine*. Vol. 61 (March 1973), 7-25; rpt. in *Ellery Queen’s Murdercade* (New York, 1975; London, 1976);


**Non-fiction books and monographs**


Articles and essays

“The Background”, The Press (Christchurch, N.Z.), 22 December 1934;

“German Anecdote”, pp. 24-27; in Lady Newall’s New Zealand Gift Book (Wellington, N.Z., 1943);

“Dialogue by Way of Introduction” (with Allen Curnow), First Year Book of the Arts in New Zealand (Wellington, N.Z. 1945), 1-8;


“Shakespeare in New Zealand”, Education 1 (October 1948), 226-230;

“A National Theatre”, Landfall 9 (March 1949), 66-69;


“A Note on a Production of Twelfth Night”, Shakespeare Survey. 8 (1955), 69-73;

“My poor boy: advice to a young author”, NZ Listener, 16 August 1957, 8-9.


“Shakespeariana’s Lunatic Fringe”, The Press, 24 April 1964;


“Achievement in Fine Arts”, The Times, 6 February 1963 (New Zealand Supplement), p. 6;

“The Quick Forge”, Landfall 18 (1964), 32-40;


“Early Reading: Dame Ngaio Marsh on A Noah’s Ark Geography”, Education, Vol. 26:7 (1977), 25;


“Portrait of Troy”; in (ed.) Dilys Winn, Murderess Ink (New York: Workman, 1979), 142-43;

“Women on Women”, Landfall 130 (June 1979), 101;


Broadcasts

29 minutes. British Commonwealth Theatre Company interview with Norman Ventura [D series; 11 minutes]. DCDR51: track 5; DAT 1081: track 10 (Radio New Zealand Sound Archives).
“Looking Back” with Elizabeth Alley (RNZ Concert Programme 1980)
“The Play’s the Thing” (Paul Bushnell, RNZ Concert FM 1995).

Plays

Published:

“The Christmas Tree” (London: SPCK, 1962) (Juvenile)

Unpublished:

“Little Housebound”; produced 1922, New Zealand.

“Exit Sir Derek”, (with Henry Jellett); produced 1935, New Zealand.

“Surfeit of Lampreys”, Marsh (with Owen B. Howell); produced 1950, UK.

“The Wyvern and Unicorn”, produced 1955, New Zealand. This play was the basis for the libretto written by Marsh for the opera “A Unicorn for Christmas”, produced 1962, New Zealand.

“False Scent” revised (with Eileen Mackay); produced 1961, UK.

“Sweet Mr. Shakespeare” (with Jonathan Elsom), produced 1976, New Zealand; Norwegian Television 1985 as “Gentle Master Shakespeare”.

Television script


(Harding 2016)
Appendix 2: Summary of forensic science used in the novels of Ngaio Marsh

<table>
<thead>
<tr>
<th>Book</th>
<th>Year</th>
<th>Weapon</th>
<th>Forensic Science</th>
<th>Special points</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Man Lay Dead</td>
<td>1934</td>
<td>Dagger</td>
<td>Finger printing (69), Chemical analysis of powder (85), typewriter key comparison (119), Inquest (167)</td>
<td></td>
</tr>
<tr>
<td>Enter a Murderer</td>
<td>1935</td>
<td>Gun, hanging</td>
<td>Finger printing (62), photography, footprint comparison (63), gun cartridge examination, chemical analysis of stage paint (93), typewriter (154), chemical analysis of dust (168)</td>
<td></td>
</tr>
<tr>
<td>The Nursing Home Murder</td>
<td>1935</td>
<td>Hyoscine</td>
<td>Blood/organ analysis for hyoscine (69) Chemical analysis of tablets &amp; powder (75)</td>
<td>Written in collaboration with Dr Henry Jellett. A lot of medical detail</td>
</tr>
<tr>
<td>Title</td>
<td>Year</td>
<td>Method</td>
<td>Details</td>
<td>References</td>
</tr>
<tr>
<td>------------------------------</td>
<td>------</td>
<td>-------------------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>-----------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Death in Ecstasy</td>
<td>1936</td>
<td>Cyanide</td>
<td>Finger printing (32) mentions using silver nitrate solution (119), chemical analysis (32),(76), paper comparison (86), pencil comparison (91), blood chemical analysis (118), impressions left on blotting paper (176)</td>
<td>Reference to psychoanalysis (61), Book 'Curiosities of Chemistry' by Abberley - how to make sodium cyanide (93), Heroin (200)</td>
</tr>
<tr>
<td>Vintage Murder</td>
<td>1937</td>
<td>Jeroboam of Champagne</td>
<td>Fingerprints (59), Photography (60)</td>
<td>Ref to Alleyn writing a text book on &quot;Principles and Practice of Criminal Investigation.&quot; Marsh has a table of Actor positions &amp; motive (142). Makes a reference to meiosis (155), Crippen reference (219)</td>
</tr>
<tr>
<td>Artists in Crime</td>
<td>1938</td>
<td>Knife rigged through boards of dais, nitric acid poisoning</td>
<td>Fingerprints &amp; photography (53), tyre prints &amp; foot print casts (90), twig samples (175), paint comparisons (208), dust analysis (217), body fluid specimens (219), chemical analysis of drink (240)</td>
<td>Meets Troy. Opium. Quite a lot of detail about Nitric acid (224,5)</td>
</tr>
<tr>
<td>Death in a White Tie</td>
<td>1938</td>
<td>Struck with cigarette case to temple, then suffocated</td>
<td>Photography (59), wool fibres (92), fingerprints (101)</td>
<td>Ref to Taylor's Medical Jurisprudence (97), ref to Alleyn&quot;s book and criminology (116), Sherlock Holmes (223)</td>
</tr>
<tr>
<td>Overture to Death</td>
<td>1939</td>
<td>Gun hidden in a piano</td>
<td>Photography (101), entry &amp; exit wounds (102), fingerprints (110), foot print casts (182), paper comparison (229)</td>
<td></td>
</tr>
<tr>
<td>------------------</td>
<td>------</td>
<td>----------------------</td>
<td>--------------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Death at the Bar</td>
<td>1940</td>
<td>Cyanide via skin wound</td>
<td>Fingerprinting (75), blood analysis &amp; chemical analysis (85, 86), photography (121), fingerprinting of paper using iodine (158), shoe prints plaster cast (172), comparing cigarette butts &amp; lipstick (171), testing for cyanide with silver nitrate (206)</td>
<td></td>
</tr>
<tr>
<td>Ref to True Detective magazine (135), compendium maleficorum (172), ref to Phineas Gage (178), Roberta Grey is from New Zealand. Dedication to Sir Hugh Ackland who helped with medical details.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Surfeit of Lampreys</td>
<td>1940</td>
<td>Skewer through the eye socket for Lord Wutherford, Razor across throat for Giggle</td>
<td>Photography (98), Fingerprinting (103), PM results (250), Direction of cut for handedness (293),</td>
<td></td>
</tr>
<tr>
<td>Dedication to Sir Hugh Ackland who helped with medical details.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Title</td>
<td>Year</td>
<td>Setting</td>
<td>Analysis Details</td>
<td>Additional Information</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>------</td>
<td>--------------------------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Death and the Dancing Footman</strong></td>
<td>1941</td>
<td>Mere blow to head</td>
<td>Analysis of fishing line cut (214), fingerprinting (215), photography (215), fibre analysis (229), hand writing comparison (257), blotting block impressions (258), Ash analysis (262)</td>
<td>Library had books on criminology and police detection (24), Ref to Sherlock Holmes (203) and (214), Croton oil as treatment of overdose (219) Suicide of Sandra Compline by overdose (178), Chart of players (228)</td>
</tr>
<tr>
<td><strong>Colour Scheme</strong></td>
<td>1943</td>
<td>Mud pool</td>
<td>Foot print casts (120)</td>
<td>Ref to Theatre Arts magazine (76), The case pivots around the murderer knowing the victim was colour blind (248)</td>
</tr>
<tr>
<td><strong>Died in the Wool</strong></td>
<td>1944</td>
<td>Branding iron blow &amp; suffocation in wool press</td>
<td>Analysis of blood stains (124)</td>
<td>Characters talk of building fuses for magnetic mines (118), very specific description of body in bale (124), talk about temperature affecting rigor (127), Ref to Crippen (246), Ref to book Famous Trials (246)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------------------------</td>
<td>---</td>
<td>-----------------</td>
<td>-----------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Final Curtain</td>
<td>1947</td>
<td>Thallium</td>
<td>Chemical analysis (179), fingerprinting (195), Marsh-Berzelius test (226), photomicrograph (230)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Thallium prescribed to treat ringworm (75), Troy now Mrs Alleyn, ref to genetics and marriage of first cousins (93), Ref to Famous Trials (124), arsenic ref used in embalming hence reason for its presence if body exhumed (124), Ref to Alleyn taking his second volume of Medical Jurisprudence book (139) by Taylor (145), arsenical Rat Bane (185), embalming formula (224)</td>
<td></td>
</tr>
<tr>
<td>Swing Brother Swing (A Wreath for Rivera)</td>
<td>1949</td>
<td>Umbrella shaft segment fired from a pistol</td>
<td>Photography (85), fingerprinting (86), Photomicrograph of gun barrel (150), comparison of typewriter print (153), ballistics (175) ballistic chemical analysis (199)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Troy pregnant, Mention of cocaine or heroin with amusing description (181)</td>
<td></td>
</tr>
<tr>
<td>Opening Night</td>
<td>1949</td>
<td>Gas &amp; Pethidine</td>
<td>Photography &amp; fingerprinting (143), chemical analysis (166)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Pethidine (190)</td>
<td></td>
</tr>
<tr>
<td>Title</td>
<td>Year</td>
<td>Method</td>
<td>Description</td>
<td></td>
</tr>
<tr>
<td>--------------------------------------------</td>
<td>------</td>
<td>-----------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Spinsters in Jeopardy</td>
<td>1953</td>
<td>Knife (172)</td>
<td>Photography</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Ricky, Alleyn &amp; Troy's son appears, is kidnapped (98). Pentothal (48), description of Grizel Locke (P.E.Garbel - chemist) resembles Ngaio Marsh (50), Hyoscine (121), Illicit drug trade (130), diacetylmorphine (155), Marihuana (229)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scales of Justice</td>
<td>1955</td>
<td>Shooting Stick and golf club</td>
<td>Photography (85), Cranial injuries examination (122), Finger printing (124), Pathologist (130), Rigor (134), Fish trace evidence (136), ground imprints (144), Blood trace evidence (149), Fish scale analysis (177), Blood group identification (224)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Fish scale science (166), Alleyn's 'homicide bag' (175)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Off With His Head (Death of a Fool)</td>
<td>1956</td>
<td>Blow to the throat, then PM decapitation with a slasher</td>
<td>Photography &amp; fingerprinting (72), shoe prints (85), blood testing (87)</td>
<td>&quot;Flash and dabs chaps&quot; (110), McNaughton Rules (114), Ernie Anderson epileptic (114), &quot;Doing a Watson&quot; (153)</td>
</tr>
<tr>
<td>Book Title</td>
<td>Year</td>
<td>Technique</td>
<td>Methods</td>
<td>Refs to books</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>------</td>
<td>--------------------</td>
<td>--------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Singing in the Shrouds</td>
<td>1958</td>
<td>Strangulation</td>
<td>Forensic psychology (50), ten day intervals (49), foot prints (202)</td>
<td>'Classic Cases of Detection, The Wainwrights in Notable Trials series, The Thing He Loves, The Ballad of Reading Gaol, The Trial of Neil Cream (151,2), passengers interested in 'the psychology of sadistic homicide (153), Freud's casebook (153), The show of Violence by Frederick Wertham (68)</td>
</tr>
<tr>
<td>False Scent</td>
<td>1960</td>
<td>Slaypest containing Hexa-ethyl-tetra-phosphate and tetra-ethyl-pyro-phosphate. Hidden in perfume spray atomiser</td>
<td>Photography &amp; fingerprinting (102), Slaypest as contact poison (104), Chemical analysis (204)</td>
<td>&quot;Handbook of Poisons by a Medical Practitioner&quot; (139), sal volatile (smelling salts)(143)</td>
</tr>
<tr>
<td>Hand in Glove</td>
<td>1962</td>
<td>Drainage pipe</td>
<td>Car tyre tread (68), boot prints (108), casts (111), photography &amp; fingerprints (111), hairs (197), soil samples (195), microphotograph (197), leather and fibre comparison (198), dog prints (226)</td>
<td></td>
</tr>
<tr>
<td>Title</td>
<td>Year</td>
<td>Description</td>
<td>Forensic Methods</td>
<td>Additional Comments</td>
</tr>
<tr>
<td>--------------------------------------</td>
<td>------</td>
<td>-----------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------------</td>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td>Dead Water</td>
<td>1963</td>
<td>Knocked unconscious with a rock, then drowned (93)</td>
<td>Rigor (95), fingerprints (99), footprints (101)(172), Cigar ash (101), photography (161)</td>
<td>Character with petit mal seizures (178)</td>
</tr>
<tr>
<td>Death at the Dolphin (Killer Dolphin)</td>
<td>1966</td>
<td>Bronze dolphin/ drop from balcony</td>
<td>Document examination with Infra red spectography (42), photography and fingerprinting (128), examination of material under fingernails (134)</td>
<td></td>
</tr>
<tr>
<td>Clutch of Constables</td>
<td>1968</td>
<td>Pressure on the carotid and vagus nerve</td>
<td>Photographhy and fingerprinting (132), footprints (137), Post Mortem marks 9158</td>
<td>Description of murder by sudden and violent pressure on the carotids (71), discussion about scientific darkening of skin pigment (99), mention of forensic psychology (117), Description and ingredients of art forgery (144)</td>
</tr>
<tr>
<td>When in Rome</td>
<td>1968</td>
<td>Strangulation</td>
<td>Photography &amp; fingerprinting (136)</td>
<td>Cocaine addiction (18), Marijuana (34), Theory about ghosts (72/3), pothead to mainliner (109), Heroin &amp; cocaine (145)</td>
</tr>
<tr>
<td>Tied up in Tinsel</td>
<td>1972</td>
<td>Blow with a poker, then broken neck with fall</td>
<td>Hair comparison (117), fingerprints (137), Photography (190)</td>
<td></td>
</tr>
<tr>
<td>Black as He's Painted</td>
<td>1974</td>
<td>Spear/ Pottery pig</td>
<td>Photography and fingerprinting (101)</td>
<td></td>
</tr>
<tr>
<td>Title</td>
<td>Year</td>
<td>Description</td>
<td>Evidence Details</td>
<td></td>
</tr>
<tr>
<td>---------------</td>
<td>------</td>
<td>----------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Last Ditch</td>
<td>1977</td>
<td>Trip wire to cause horse fall</td>
<td>Hoof print casts (138), photography (141)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Ricky Alleyn main character, quote on smuggling in 'every kind of outlandish means of transit...' (123), dexie = street name for amphetamine (191), Horse = heroin (231)</td>
<td></td>
</tr>
<tr>
<td>Grave Mistake</td>
<td>1978</td>
<td>Barbiturate overdose made to look like suicide &amp; smothered with pillow (124)/ slit throat</td>
<td>Stomach contents (56), Onset of action of drug (105), Photography and fingerprinting (110), footprints (123), lipstick comparison (124), teeth bite comparison (127)</td>
<td></td>
</tr>
<tr>
<td>Photo Finish</td>
<td>1980</td>
<td>Chloroform and asphyxia and PM stabbing</td>
<td>Forensic document examination (50), photography &amp; fingerprinting (105), observation of asphyxial haemorrhages (124)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Cadaveric spasm (104), description of PM blood pooling (231)</td>
<td></td>
</tr>
<tr>
<td>Light Thickens</td>
<td>1982</td>
<td>Claymore sword</td>
<td>Photography &amp; fingerprinting (165)</td>
<td></td>
</tr>
</tbody>
</table>
Appendix 3: Secondary Materials

Magazine articles

<table>
<thead>
<tr>
<th>Name</th>
<th>Title</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fraser, Kate</td>
<td>A Literary Life</td>
<td>NZ House &amp; Garden. April 1998</td>
</tr>
<tr>
<td>Parsons, Elizabeth</td>
<td>Dame Ngaio Marsh</td>
<td>New Zealand Home Journal. March 1967</td>
</tr>
<tr>
<td>Marsh, Ngaio</td>
<td>Black Beech and Honeydew</td>
<td>Weekly News New Zealand. April 6 1966</td>
</tr>
<tr>
<td>Paske, Helen</td>
<td>Lengthy Despatches and Poisonous Whines</td>
<td>Listener, July 8-14 1978</td>
</tr>
</tbody>
</table>

Online articles

<table>
<thead>
<tr>
<th>Name</th>
<th>Title</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Author</td>
<td>Summary</td>
<td>Access Details</td>
</tr>
<tr>
<td>------------------------</td>
<td>-------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Hunt, Tom</td>
<td>Ngaio Marsh's name a mystery to US Public</td>
<td><a href="http://www.stuff.co.nz/entertainment/books/66476172/ngaio-marchs-name-a-mystery-to-us-public">http://www.stuff.co.nz/entertainment/books/66476172/ngaio-marchs-name-a-mystery-to-us-public</a> Date accessed 21/02/2015</td>
</tr>
</tbody>
</table>

**Books**

<table>
<thead>
<tr>
<th>Author</th>
<th>Title</th>
<th>Publisher</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lewis, Margaret</td>
<td>Ngaio Marsh: A Life</td>
<td>1991, Bridget Williams Books Ltd. Wellington, New Zealand</td>
</tr>
<tr>
<td>Rogers, Anna</td>
<td>Christchurch: The City in Literature: Our City</td>
<td>2003, Exile Publishing, Auckland, New Zealand</td>
</tr>
<tr>
<td>Weinkauf, Mary S.</td>
<td>Murder Most Poetic: The Mystery Novels of Ngaio Marsh</td>
<td>1996, Brownstone Books, San Bernadino, CA, USA</td>
</tr>
</tbody>
</table>
### Conference Papers

<table>
<thead>
<tr>
<th>Authors</th>
<th>Title</th>
<th>Location</th>
</tr>
</thead>
</table>

### Newspaper Articles (Accessed via Papers Past http://paperspast.natlib.govt.nz)

<table>
<thead>
<tr>
<th>Newspaper</th>
<th>Title</th>
<th>Volume Issue Page</th>
<th>Accessed</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Press</td>
<td>Navy League: Results of essay competition</td>
<td>LXVI, Issue 13866, 18 October 1910, Page 8</td>
<td>19/06/2013</td>
</tr>
<tr>
<td>The Press</td>
<td>St Margaret’s College</td>
<td>XLVIII, Issue 14537, 13 December 1912, Page 5</td>
<td>19/06/2013</td>
</tr>
<tr>
<td>The Evening Post</td>
<td>Writer Returns: Popular mystery stories: Miss Ngaio Marsh's Success</td>
<td>CXXV, Issue 48, 26 February 1938, Page 19</td>
<td>19/06/2013</td>
</tr>
<tr>
<td>The Evening Post</td>
<td>Change in education: N.Z. novelist's ideas</td>
<td>CXXV, Issue 89, 16 April 1938, Page 18</td>
<td>19/06/2013</td>
</tr>
<tr>
<td>The Auckland Star</td>
<td>Gnus about Ngaio</td>
<td>LXX, Issue 165, 15 July 1939, Page 3</td>
<td>19/06/2013</td>
</tr>
<tr>
<td>The Evening Post</td>
<td>Amusing speeches: Authors describe work: Party at exhibition</td>
<td>CXXIX, Issue 62, 13 March 1940, Page 16</td>
<td>19/06/2013</td>
</tr>
<tr>
<td>The Evening Post</td>
<td>Othello: Students in Shakespeare</td>
<td>CXXXIX, Issue 29, 3 February 1945, Page 8</td>
<td>25/06/2013</td>
</tr>
<tr>
<td>The Evening Post</td>
<td>News of the day: Nomenclature</td>
<td>CXL, Issue 48, 25 August 1945, Page 6</td>
<td>25/06/2013</td>
</tr>
<tr>
<td>The Evening Post</td>
<td>Detectives in fiction: Miss Ngaio Marsh’s views</td>
<td>CIX, Issue 76, 30 March 1935, Page 18</td>
<td>19/06/2013</td>
</tr>
</tbody>
</table>

### Television Documentary

<table>
<thead>
<tr>
<th>Authors</th>
<th>Title</th>
<th>Year</th>
<th>Production Company</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clark, Bruce</td>
<td>Three New Zealanders: Ngaio Marsh</td>
<td>1977</td>
<td>Endeavour Films</td>
</tr>
<tr>
<td>O'Sullivan, Aileen</td>
<td>Ngaio Marsh Crime Queen</td>
<td>2011</td>
<td>Seannachie Productions</td>
</tr>
</tbody>
</table>
Appendix 4: Guide for interviews of individuals who knew Ngaio Marsh

Question 1: What was your association with Ngaio Marsh?

Question 2: Did you feel Ngaio Marsh took research and accuracy seriously?

Question 3: What research methods did Ngaio Marsh talk about?

Question 4: Were you aware of any specific individuals Ngaio Marsh talked to about scientific or medical background information for her novels?

Question 5: Were you aware of Ngaio Marsh talking with actors who were involved with sciences in the University of Canterbury about research for her novels?
Appendix 5: Reader Survey for distribution

Do you believe the science you read in crime fiction?

Thank you for your interest in this project. Please read this introduction carefully before deciding whether or not to participate. If you decide to participate, fantastic. If you decide not to take part there will be no disadvantage to you and we thank you for considering our request.

The aim of the project is to survey crime fiction readers to see if they believe the forensic science they read in crime fiction, and how important the accuracy of that science is to them. By forensic science we mean the science and technology used to establish facts in relation to a crime. Some examples of this are fingerprinting, DNA identification, entomology or the use of insects, blood chemical analysis, post-mortem information, gun shot residue, blood spatter analysis, dental evidence, forensic psychology.

We are looking for people who enjoy reading crime fiction to participate in a brief, anonymous survey. You will be receiving this invitation if you belong to a book group, or library or are on the emailing list from a bookstore.

The data collected from the survey will be used in the research of a PhD candidate at the University of Otago. The results will be held, as part of that research, in the library of the University of Otago, and may be published in academic publications.

This project has been authorised by the Human Ethics Committee, approval D13/301.

If you wish to participate in the survey, please click next to begin.
1. Do you read crime fiction?

- [ ] Yes
- [ ] No
Following is a series of statements relating to the use of forensic science in crime fiction novels. Please indicate your level of agreement or disagreement with each statement. There is also room for comments if you wish to comment on the statement.

2. I like to read crime fiction that includes the use of forensic science.
   - Agree strongly
   - Agree
   - Neutral
   - Disagree
   - Disagree strongly

   Comments

3. I find crime fiction novels that contain forensic science are more believable.
   - Agree strongly
   - Agree
   - Neutral
   - Disagree
   - Disagree strongly

   Comments

4. I read crime fiction purely for entertainment.
   - Agree strongly
   - Agree
   - Neutral
   - Disagree
   - Disagree strongly

   Comments
5. When I read crime fiction I am interested in the forensic science as well as the story.
   ○ Agree strongly
   ○ Agree
   ○ Neutral
   ○ Disagree
   ○ Disagree strongly
   Comments

6. I like to learn some interesting forensic science when I read crime fiction.
   ○ Agree strongly
   ○ Agree
   ○ Neutral
   ○ Disagree
   ○ Disagree strongly
   Comments

7. I expect to learn some interesting forensic science when I read crime fiction.
   ○ Agree strongly
   ○ Agree
   ○ Neutral
   ○ Disagree
   ○ Disagree strongly
   Comments
8. It is important to me that the forensic science in crime fiction novels is true and accurate.
   - Agree strongly
   - Agree
   - Neutral
   - Disagree
   - Disagree strongly

   Comments

9. I believe the forensic science in crime fiction is true and accurate.
   - Agree strongly
   - Agree
   - Neutral
   - Disagree
   - Disagree strongly

   Comments

10. I believe most writers take care to ensure the forensic science they use in crime fiction is true and accurate.
    - Agree strongly
    - Agree
    - Neutral
    - Disagree
    - Disagree strongly

   Comments

11. Please name some crime writers you feel you can trust to provide true and accurate forensic science in their crime fiction novels.
12. Please name some crime writers you do NOT trust to provide true and accurate forensic science in their crime fiction novels.

13. If I find errors in the forensic science used in a novel, it affects my belief in all aspects of the novel.
   - Agree strongly
   - Agree
   - Neutral
   - Disagree
   - Disagree strongly

   Comments

14. Watching forensic TV programmes such as CSI has increased my expectation on writers to include forensic science in their novels.
   - Agree strongly
   - Agree
   - Neutral
   - Disagree
   - Disagree strongly

   Other (please specify)

15. I believe the accuracy of science written in a novel more than the accuracy of the science I see in a TV programme such as CSI.
   - Agree strongly
   - Agree
   - Neutral
   - Disagree
   - Disagree strongly

   Comments
16. Do you have any comments you would like to make about the forensic science in crime fiction novels?
17. What is your age in years?
- 10-19
- 20-29
- 30-39
- 40-49
- 50-59
- 60-69
- 70-75
- 80+

18. What is your gender?
- Male
- Female

19. What is your ethnicity?
- NZ European
- Māori
- Pacific Island
- Australian
- European
- Asian
- American
- African
- Other (please specify)

20. What is your highest educational qualification?
- PhD
- Postgraduate degree or diploma
- Undergraduate degree
- Secondary school qualification
- Other (please specify)

21. What is your occupation?

22. What country do you currently reside in?
Thank you for participating in this survey. We appreciate your time.

If you have any further queries about the survey please contact

Professor Jean Fleming
Centre for Science Communication
University of Otago
jean.fleming@otago.ac.nz
Appendix 6: Author survey for distribution

INFORMATION SHEET FOR PARTICIPANTS

Thank you for your interest in this project. Please read this information sheet carefully before deciding whether or not to participate. If you decide to participate, fantastic. If you decide not to take part there will be no disadvantage to you and we thank you for considering our request.

The aim of the project is to conduct a survey of writers of crime fiction to examine their attitude to providing accurate forensic science in their novels, and to the potential consequences of providing that science. By forensic science we mean the science and technology used to establish facts in relation to a crime. Some examples of this are fingerprinting, DNA identification, entomology or the use of insects, blood chemical analysis, post mortem information, gun shot residue, blood spatter analysis, dental evidence, forensic psychology.

We are looking for writers of crime fiction to participate in a brief, anonymous survey. There is room for comments with each question and these will also remain anonymous.

The data collected from the survey will be used in the research of a PhD candidate at the University of Otago. The results will be held, as part of that research, in the library of the University of Otago, and may be published in academic publications.

You may withdraw from participation in the project at any time and without any disadvantage to yourself of any kind.

If you have any questions about this project, either now or in the future, please feel free to contact:

Professor Jean Fleming
Centre for Science Communication
University of Otago
jean.fleming@otago.ac.nz

This survey is authorised by the human Ethics Committee, number 13/037.

If you wish to participate in the survey, please click next to begin.
Survey.

1. Do you write crime fiction?
   - YES
   - NO
2. What genre or genres of crime fiction do you write?

3. Do you include the use of forensic science in your crime fiction novels?
   - Always
   - Sometimes
   - Never

Comments
Following is a series of statements relating to the use of forensic science in crime fiction. Please indicate your level of agreement or disagreement with each statement. There is also room if you wish to comment on the statement.

4. Readers expect crime fiction novels to contain forensic science.
   - Agree strongly
   - Agree
   - Neutral
   - Disagree
   - Disagree strongly

   Comments

5. Readers take crime fiction that contains forensic science more seriously.
   - Agree strongly
   - Agree
   - Neutral
   - Disagree
   - Disagree strongly

   Comments

6. The advent of forensic TV programmes such as CSI has increased the pressure on writers to include forensic science in their novels.
   - Agree strongly
   - Agree
   - Neutral
   - Disagree
   - Disagree strongly

   Comments
7. Readers believe the forensic science they read in crime fiction is true and accurate.
   - Agree strongly
   - Agree
   - Neutral
   - Disagree
   - Disagree strongly
   Comments

8. Readers believe the accuracy of science written in a novel more than the accuracy of science they see in a TV programme such as CSI.
   - Agree strongly
   - Agree
   - Neutral
   - Disagree
   - Disagree strongly
   Comments
9. I like to thoroughly research the forensic science I use in my novels.

- Agree strongly
- Agree
- Neutral
- Disagree
- Disagree strongly

Comments

10. I always ensure the science I include in my fiction is correct.

- Agree strongly
- Agree
- Neutral
- Disagree
- Disagree strongly

Comments

11. I am happy to have slightly incorrect scientific information if it advances the story.

- Agree strongly
- Agree
- Neutral
- Disagree
- Disagree strongly

Comments
12. I feel an ethical obligation to ensure the forensic science included in my novels is correct.
   - Agree strongly
   - Agree
   - Neutral
   - Disagree
   - Disagree strongly

Comments

13. I worry that a reader will point out a factual error in my work.
   - Agree strongly
   - Agree
   - Neutral
   - Disagree
   - Disagree strongly

Comments

14. When researching the forensic science in your crime fiction, what sources and methods do you use?

Comments
The next series of statements relate to your feelings about the potential for copy-cat crime as result of someone reading your work. There is room after each statement if you wish to make a comment.

15. I am concerned about the potential for copy-cat crime as a result of my fiction writing.
   - Agree strongly
   - Agree
   - Neutral
   - Disagree
   - Disagree strongly

Comments

16. I have purposefully withheld scientific information in my novels due to my concern for potential copy-cat crime occurring.
   - Yes
   - No

Comments

17. My work has had copy-cat crime occur where the perpetrators used methods or inspiration from my writing.
   - Yes
   - No

If yes, please give examples.

Comments
18. I am concerned that perpetrators will learn how to avoid leaving behind evidence as a result of reading my crime fiction.

- Agree strongly
- Agree
- Neutral
- Disagree
- Disagree strongly

Comments

19. I have purposefully withheld scientific information in my novels due to my concern for perpetrators learning how to avoid leaving behind forensic evidence.

- Agree strongly
- Agree
- Neutral
- Disagree
- Disagree strongly

Comments

20. Do you wish to make any further comment about the use of forensic science in crime fiction?
<table>
<thead>
<tr>
<th>Demographic information.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>21. What is your age in years?</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

**22. What is your gender?**

- Male
- Female

**23. What is your ethnicity?**

- NZ European
- Maori
- Pacific Island
- Australian
- European
- Asian
- American
- African

Other (please specify)

**24. What is your highest educational qualification?**

- PhD
- Postgraduate degree or diploma
- Undergraduate degree
- Secondary school qualification

Other (please specify)

**25. What country do you currently reside in?**

[ ]
Thank you for participating in this survey. We appreciate your time.

If you have any further queries about the survey please contact

Professor Jean Fleming
Centre for Science Communication
University of Otago
jean.fleming@otago.ac.nz
## Appendix 7: URLs for author survey initial snowball sampling seeding

<table>
<thead>
<tr>
<th>Group</th>
<th>URL</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Zealand Society of Authors (NZSA)</td>
<td><a href="http://www.authors.org.nz">www.authors.org.nz</a></td>
</tr>
<tr>
<td>NZSA Otago Southland Branch</td>
<td><a href="mailto:otagosouthlandnzsa@gmail.com">otagosouthlandnzsa@gmail.com</a></td>
</tr>
<tr>
<td>Gregory and Company Literary Agents</td>
<td>gregoryandcompany.co.uk</td>
</tr>
<tr>
<td>Sisters in Crime, Australia</td>
<td><a href="http://www.sistersincrime.org.au">www.sistersincrime.org.au</a></td>
</tr>
<tr>
<td>British Crime Writers Association</td>
<td><a href="http://www.cwa.co.uk">www.cwa.co.uk</a></td>
</tr>
<tr>
<td>Australia Crime Writers Association</td>
<td><a href="http://www.austcrimewriters.com">www.austcrimewriters.com</a></td>
</tr>
<tr>
<td>Friend Feed Crime writer discussion board</td>
<td>friendfeed.com/crime-and-mystery-fiction</td>
</tr>
</tbody>
</table>
## Appendix 8: URLs for reader survey initial snowball sampling seeding

<table>
<thead>
<tr>
<th>Group</th>
<th>URL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beattie’s Book Blog</td>
<td><a href="http://www.beattiesbookblog.blogspot.com">www.beattiesbookblog.blogspot.com</a></td>
</tr>
<tr>
<td>The Dunedin City Libraries Network</td>
<td><a href="http://www.dunedinlibraries.govt.nz">www.dunedinlibraries.govt.nz</a></td>
</tr>
<tr>
<td>Christchurch City Libraries</td>
<td><a href="mailto:library@ccc.govt.nz">library@ccc.govt.nz</a></td>
</tr>
<tr>
<td>The University Book Shop, Dunedin</td>
<td><a href="http://www.unibooks.co.nz">www.unibooks.co.nz</a></td>
</tr>
<tr>
<td>The New Zealand Society of Authors (NZSA)</td>
<td>authors.org.nz</td>
</tr>
<tr>
<td>The Otago Southland branch of the NZSA</td>
<td><a href="mailto:nzsaotagosouthland@gmail.com">nzsaotagosouthland@gmail.com</a></td>
</tr>
<tr>
<td>The New Zealand Book Council</td>
<td><a href="http://www.bookcouncil.org.nz">www.bookcouncil.org.nz</a></td>
</tr>
<tr>
<td>WEA (Workers Educational Association)</td>
<td><a href="http://www.wea.org.nz">www.wea.org.nz</a></td>
</tr>
<tr>
<td>Women’s Book Shop, Auckland</td>
<td><a href="http://www.womensbookshop.co.nz">www.womensbookshop.co.nz</a></td>
</tr>
<tr>
<td>Unity Books, Wellington</td>
<td><a href="http://www.unitybooks.nz">www.unitybooks.nz</a></td>
</tr>
<tr>
<td>Crime Watch book blog</td>
<td><a href="http://www.kiwicrime.blogspot.com">www.kiwicrime.blogspot.com</a></td>
</tr>
<tr>
<td>The University of Otago English Department</td>
<td><a href="http://www.otago.ac.nz/english">www.otago.ac.nz/english</a></td>
</tr>
<tr>
<td>The University of Otago Zoology Department</td>
<td><a href="http://www.otago.ac.nz/zooology">www.otago.ac.nz/zooology</a></td>
</tr>
<tr>
<td>The University of Otago School of Pharmacy</td>
<td><a href="http://www.otago.ac.nz/pharmacy">www.otago.ac.nz/pharmacy</a></td>
</tr>
<tr>
<td>The University of Otago Centre for Science Communication</td>
<td><a href="http://www.sciencecommunication.info">www.sciencecommunication.info</a></td>
</tr>
<tr>
<td>Victoria University English Department</td>
<td><a href="http://www.victoria.ac.nz/seftms/home">www.victoria.ac.nz/seftms/home</a></td>
</tr>
<tr>
<td>Auckland University English Department</td>
<td><a href="http://www.arts.auckland.ac.nz">www.arts.auckland.ac.nz</a></td>
</tr>
<tr>
<td>Quote Unquote</td>
<td><a href="http://www.quoteunquotenz.blogspot.com">www.quoteunquotenz.blogspot.com</a></td>
</tr>
<tr>
<td>LIANZA (Library and Information Association of New Zealand Aotearoa)</td>
<td><a href="http://www.lianza.org.nz">www.lianza.org.nz</a></td>
</tr>
<tr>
<td>SLANZA (School Library Association of New Zealand Aotearoa)</td>
<td><a href="http://www.slanza.org.nz">www.slanza.org.nz</a></td>
</tr>
<tr>
<td>Goodreads</td>
<td><a href="http://www.goodreads.com">www.goodreads.com</a></td>
</tr>
</tbody>
</table>

### Declined

<table>
<thead>
<tr>
<th>Declined</th>
<th>URL</th>
</tr>
</thead>
<tbody>
<tr>
<td>University of Otago Scarfie.com</td>
<td><a href="http://www.scarfie.com">www.scarfie.com</a></td>
</tr>
<tr>
<td>Auckland City Libraries</td>
<td><a href="http://www.aucklandlibraries.govt.nz">www.aucklandlibraries.govt.nz</a></td>
</tr>
<tr>
<td>Wellington City Libraries</td>
<td>wcl.govt.nz</td>
</tr>
</tbody>
</table>
Appendix 9: Author survey nVivo themes

No
Amateur detective
Avoidance
I do not glamorise crime
I don’t worry about reader opinion
Fictional crime is different to real crime
Fiction inspired by crime
Historical
It’s fiction
Not applicable to my subgenre
The information is available everywhere
Not Applicable
Yes
As a tool
Expect pressure due to TV exposure
Forensic science adds authority
Part of modern policing
Qualification
Readers are knowledgeable
Reference to forensic science, not detailed
I research for accuracy
The crime requires it.
Undecided
Context of story
Depends on accuracy
Depends on author
Reader preference
TV is false
Appendix 10: Reader survey nVivo themes

CSI type shows aren't true
It depends on context or genre of the novel
It depends on the author
I don't look for errors
Forensic science career
I don't believe all of it
I don't watch CSI type shows
I learn information from it
Inaccuracy detracts from story
It's fiction and entertainment
No
Not applicable
Not exclusively
I'm not qualified to say
I don't want too much detail
Science enhances the story
Science gives authenticity
Science must be accurate
Undecided
Yes
If the author has researched
If it seems believable
Plot and character is more important
Appendix 11: Correlations between reader survey statements

<table>
<thead>
<tr>
<th>Statements</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Question 2: I like to read crime fiction that includes the use of forensic science</strong></td>
<td></td>
</tr>
<tr>
<td>I find crime fiction novels that contain forensic science are more believable</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>I read crime fiction purely for entertainment</td>
<td>0.0911</td>
</tr>
<tr>
<td>When I read crime fiction I am interested in the forensic science as well as the story</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>I like to learn some interesting forensic science when I read crime fiction</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>I expect to learn some interesting forensic science when I read crime fiction</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>It is important to me that the forensic science in crime fiction novels is true and accurate</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>I believe the forensic science in crime fiction is true and accurate</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>I believe most writers take care to ensure the forensic science they use in crime fiction is true and accurate</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>If I find errors in the forensic science used in a novel it affects my belief in all aspects of the novel</td>
<td>0.0100</td>
</tr>
<tr>
<td>Watching forensic TV programmes such as CSI has increased my expectation on writers to include forensic science in their novels</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>I believe the accuracy of science written in a novel more than the accuracy of the science I see in a TV programme such as CSI</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td><strong>Question 3: I find crime fiction novels that contain forensic science are more believable</strong></td>
<td></td>
</tr>
<tr>
<td>I read crime fiction purely for entertainment</td>
<td>0.0349</td>
</tr>
<tr>
<td>When I read crime fiction I am interested in the forensic science as well as the story</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>I like to learn some interesting forensic science when I read crime fiction</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>I expect to learn some interesting forensic science when I read crime fiction</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>It is important to me that the forensic science in crime fiction novels is true and accurate</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>I believe the forensic science in crime fiction is true and accurate</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>I believe most writers take care to ensure the forensic science they use in crime fiction is true and accurate</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>If I find errors in the forensic science used in a novel it affects my belief in all aspects of the novel</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Watching forensic TV programmes such as CSI has increased my expectation on writers to include forensic science in their novels</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>I believe the accuracy of science written in a novel more than the accuracy of the science I see in a TV programme such as CSI</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td><strong>Question 4: I read crime fiction purely for entertainment</strong></td>
<td></td>
</tr>
<tr>
<td>When I read crime fiction I am interested in the forensic science as well as the story</td>
<td>0.2528</td>
</tr>
<tr>
<td>I like to learn some interesting forensic science when I read crime fiction</td>
<td>0.5846</td>
</tr>
<tr>
<td>I expect to learn some interesting forensic science when I read crime fiction</td>
<td>0.0741</td>
</tr>
<tr>
<td>It is important to me that the forensic science in crime fiction novels is true and accurate</td>
<td>0.9003</td>
</tr>
<tr>
<td>I believe the forensic science in crime fiction is true and accurate</td>
<td>0.4381</td>
</tr>
<tr>
<td>I believe most writers take care to ensure the forensic science they use in crime fiction is true and accurate</td>
<td>0.2699</td>
</tr>
<tr>
<td>If I find errors in the forensic science used in a novel it affects my belief in all aspects of the novel</td>
<td>0.0057</td>
</tr>
<tr>
<td>Watching forensic TV programmes such as CSI has increased my expectation on writers to include forensic science in their novels</td>
<td>0.0188</td>
</tr>
<tr>
<td>I believe the accuracy of science written in a novel more than the accuracy of the science I see in a TV programme such as CSI</td>
<td>0.8567</td>
</tr>
</tbody>
</table>
**Question 5:** When I read crime fiction I am interested in the forensic science as well as the story

<table>
<thead>
<tr>
<th>Statement</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>I like to learn some interesting forensic science when I read crime fiction</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>I expect to learn some interesting forensic science when I read crime fiction</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>It is important to me that the forensic science in crime fiction novels is true and accurate</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>I believe the forensic science in crime fiction is true and accurate</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>I believe most writers take care to ensure the forensic science they use in crime fiction is true and accurate</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>If I find errors in the forensic science used in a novel it affects my belief in all aspects of the novel</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Watching forensic TV programmes such as CSI has increased my expectation on writers to include forensic science in their novels</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>I believe the accuracy of science written in a novel more than the accuracy of the science I see in a TV programme such as CSI</td>
<td>&lt;0.0001</td>
</tr>
</tbody>
</table>

**Question 6:** I like to learn some interesting forensic science when I read crime fiction

<table>
<thead>
<tr>
<th>Statement</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>I expect to learn some interesting forensic science when I read crime fiction</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>It is important to me that the forensic science in crime fiction novels is true and accurate</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>I believe the forensic science in crime fiction is true and accurate</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>I believe most writers take care to ensure the forensic science they use in crime fiction is true and accurate</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>If I find errors in the forensic science used in a novel it affects my belief in all aspects of the novel</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Watching forensic TV programmes such as CSI has increased my expectation on writers to include forensic science in their novels</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>I believe the accuracy of science written in a novel more than the accuracy of the science I see in a TV programme such as CSI</td>
<td>&lt;0.0001</td>
</tr>
</tbody>
</table>

**Question 7:** I expect to learn some interesting some interesting forensic science when I read crime fiction

<table>
<thead>
<tr>
<th>Statement</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>It is important to me that the forensic science in crime fiction novels is true and accurate</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>I believe the forensic science in crime fiction is true and accurate</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>I believe most writers take care to ensure the forensic science they use in crime fiction is true and accurate</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>If I find errors in the forensic science used in a novel it affects my belief in all aspects of the novel</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Watching forensic TV programmes such as CSI has increased my expectation on writers to include forensic science in their novels</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>I believe the accuracy of science written in a novel more than the accuracy of the science I see in a TV programme such as CSI</td>
<td>&lt;0.0001</td>
</tr>
</tbody>
</table>

**Question 8:** It is important to me that the forensic science in crime fiction novels is true and accurate

<table>
<thead>
<tr>
<th>Statement</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>I believe the forensic science in crime fiction is true and accurate</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>I believe most writers take care to ensure the forensic science they use in crime fiction is true and accurate</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>If I find errors in the forensic science used in a novel it affects my belief in all aspects of the novel</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Watching forensic TV programmes such as CSI has increased my expectation on writers to include forensic science in their novels</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>I believe the accuracy of science written in a novel more than the accuracy of the science I see in a TV programme such as CSI</td>
<td>&lt;0.0001</td>
</tr>
</tbody>
</table>
### Question 9: I believe the forensic science in crime fiction is true and accurate

<table>
<thead>
<tr>
<th>Statement</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>I believe most writers take care to ensure the forensic science they use in crime fiction is true and accurate</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>If I find errors in the forensic science used in a novel it affects my belief in all aspects of the novel</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Watching forensic TV programmes such as CSI has increased my expectation on writers to include forensic science in their novels</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>I believe the accuracy of science written in a novel more than the accuracy of the science I see in a TV programme such as CSI</td>
<td>&lt;0.0001</td>
</tr>
</tbody>
</table>

### Question 10: I believe most writers take care to ensure the forensic science they use in crime fiction is true and accurate

<table>
<thead>
<tr>
<th>Statement</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>If I find errors in the forensic science used in a novel it affects my belief in all aspects of the novel</td>
<td>0.0014</td>
</tr>
<tr>
<td>Watching forensic TV programmes such as CSI has increased my expectation on writers to include forensic science in their novels</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>I believe the accuracy of science written in a novel more than the accuracy of the science I see in a TV programme such as CSI</td>
<td>0.0002</td>
</tr>
</tbody>
</table>

### Question 13: If I find errors in the forensic science used in a novel it affects my belief in all aspects of the novel

<table>
<thead>
<tr>
<th>Statement</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Watching forensic TV programmes such as CSI has increased my expectation on writers to include forensic science in their novels</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>I believe the accuracy of science written in a novel more than the accuracy of the science I see in a TV programme such as CSI</td>
<td>&lt;0.0001</td>
</tr>
</tbody>
</table>

### Question 14: Watching forensic TV programmes such as CSI has increased my expectation on writers to include forensic science in their novels

<table>
<thead>
<tr>
<th>Statement</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>I believe the accuracy of science written in a novel more than the accuracy of the science I see in a TV programme such as CSI</td>
<td>0.6810</td>
</tr>
</tbody>
</table>
## Appendix 12: Reader Survey Country of Residence

<table>
<thead>
<tr>
<th>Region</th>
<th>Country</th>
<th>Total Participants</th>
<th>Tertile 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oceania</td>
<td>Australia</td>
<td>40</td>
<td>35</td>
</tr>
<tr>
<td></td>
<td>New Zealand</td>
<td>278</td>
<td>109</td>
</tr>
<tr>
<td>Europe</td>
<td>United Kingdom</td>
<td>45</td>
<td>44</td>
</tr>
<tr>
<td></td>
<td>England</td>
<td>27</td>
<td>27</td>
</tr>
<tr>
<td></td>
<td>Scotland</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>Wales</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Ireland</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Belgium</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>France</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Germany</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Netherlands</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Denmark</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Finland</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Norway</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Sweden</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Italy</td>
<td>7</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Spain</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Croatia</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Cyprus</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Slovenia</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Poland</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Asia</td>
<td>Thailand</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Philippines</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Singapore</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Japan</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Taiwan</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>India</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Americas</td>
<td>Canada</td>
<td>25</td>
<td>23</td>
</tr>
<tr>
<td></td>
<td>USA</td>
<td>305</td>
<td>301</td>
</tr>
<tr>
<td></td>
<td>Argentina</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Brazil</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Venezuela</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Africa</td>
<td>South Africa</td>
<td>8</td>
<td>8</td>
</tr>
</tbody>
</table>
## Appendix 13: Correlations between time-based tertiles and reader survey statements

Question 2: I like to read crime fiction that includes the use of forensic science ($p<0.0001$).

<table>
<thead>
<tr>
<th>Tertile</th>
<th>Agree strongly</th>
<th>Agree</th>
<th>Neutral</th>
<th>Disagree</th>
<th>Disagree strongly</th>
</tr>
</thead>
<tbody>
<tr>
<td>1: Early responders</td>
<td>19.3</td>
<td>55.7</td>
<td>25.0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2: Mid-responders</td>
<td>18.3</td>
<td>57.3</td>
<td>22.1</td>
<td>2.3</td>
<td>0</td>
</tr>
<tr>
<td>3: Late responders</td>
<td>58.2</td>
<td>37.2</td>
<td>4.3</td>
<td>0.3</td>
<td>0</td>
</tr>
</tbody>
</table>

Question 3: I find crime fiction novels that contain forensic science are more believable ($p<0.0001$).

<table>
<thead>
<tr>
<th>Tertile</th>
<th>Agree strongly</th>
<th>Agree</th>
<th>Neutral</th>
<th>Disagree</th>
<th>Disagree strongly</th>
</tr>
</thead>
<tbody>
<tr>
<td>1: Early responders</td>
<td>10.1</td>
<td>43.8</td>
<td>30.3</td>
<td>15.7</td>
<td>0</td>
</tr>
<tr>
<td>2: Mid-responders</td>
<td>15.2</td>
<td>47.0</td>
<td>30.3</td>
<td>7.6</td>
<td>0</td>
</tr>
<tr>
<td>3: Late responders</td>
<td>36.3</td>
<td>42.5</td>
<td>19.2</td>
<td>2.0</td>
<td>0</td>
</tr>
</tbody>
</table>

Question 4: I read crime fiction purely for enjoyment ($p=0.2049$).

<table>
<thead>
<tr>
<th>Tertile</th>
<th>Agree strongly</th>
<th>Agree</th>
<th>Neutral</th>
<th>Disagree</th>
<th>Disagree strongly</th>
</tr>
</thead>
<tbody>
<tr>
<td>1: Early responders</td>
<td>40.9</td>
<td>43.2</td>
<td>6.8</td>
<td>8.0</td>
<td>1.1</td>
</tr>
<tr>
<td>2: Mid-responders</td>
<td>36.4</td>
<td>54.6</td>
<td>6.8</td>
<td>2.3</td>
<td>0</td>
</tr>
<tr>
<td>3: Late responders</td>
<td>44.4</td>
<td>42.9</td>
<td>8.6</td>
<td>3.6</td>
<td>0.4</td>
</tr>
</tbody>
</table>
Question 5: When I read crime fiction I am interested in the forensic science as well as the story ($p<0.0001$).

<table>
<thead>
<tr>
<th>Tertile</th>
<th>Agree strongly</th>
<th>Agree</th>
<th>Neutral</th>
<th>Disagree</th>
<th>Disagree strongly</th>
</tr>
</thead>
<tbody>
<tr>
<td>1: Early responders</td>
<td>16.9</td>
<td>51.7</td>
<td>20.2</td>
<td>11.2</td>
<td>0</td>
</tr>
<tr>
<td>2: Mid-responders</td>
<td>11.4</td>
<td>49.2</td>
<td>28.8</td>
<td>10.6</td>
<td>0</td>
</tr>
<tr>
<td>3: Late responders</td>
<td>42.1</td>
<td>44.6</td>
<td>10.8</td>
<td>2.4</td>
<td>0.1</td>
</tr>
</tbody>
</table>

Question 6: I like to learn some interesting forensic science when I read crime fiction ($p<0.0001$).

<table>
<thead>
<tr>
<th>Tertile</th>
<th>Agree strongly</th>
<th>Agree</th>
<th>Neutral</th>
<th>Disagree</th>
<th>Disagree strongly</th>
</tr>
</thead>
<tbody>
<tr>
<td>1: Early responders</td>
<td>14.9</td>
<td>54.0</td>
<td>19.5</td>
<td>10.3</td>
<td>1.2</td>
</tr>
<tr>
<td>2: Mid-responders</td>
<td>12.3</td>
<td>47.7</td>
<td>30.8</td>
<td>7.7</td>
<td>1.5</td>
</tr>
<tr>
<td>3: Late responders</td>
<td>39.3</td>
<td>45.8</td>
<td>12.9</td>
<td>1.9</td>
<td>0.1</td>
</tr>
</tbody>
</table>

Question 7: I expect to learn some interesting forensic science when I read crime fiction ($p<0.001$).

<table>
<thead>
<tr>
<th>Tertile</th>
<th>Agree strongly</th>
<th>Agree</th>
<th>Neutral</th>
<th>Disagree</th>
<th>Disagree strongly</th>
</tr>
</thead>
<tbody>
<tr>
<td>1: Early responders</td>
<td>5.6</td>
<td>33.7</td>
<td>33.7</td>
<td>24.7</td>
<td>2.3</td>
</tr>
<tr>
<td>2: Mid-responders</td>
<td>6.1</td>
<td>17.4</td>
<td>49.2</td>
<td>23.5</td>
<td>3.8</td>
</tr>
<tr>
<td>3: Late responders</td>
<td>22.2</td>
<td>35.2</td>
<td>30.3</td>
<td>11.1</td>
<td>1.2</td>
</tr>
</tbody>
</table>
Question 8: It is important to me that the forensic science in crime fiction novels is true and accurate ($p<0.0001$).

<table>
<thead>
<tr>
<th>Tertile</th>
<th>Agree strongly</th>
<th>Agree</th>
<th>Neutral</th>
<th>Disagree</th>
<th>Disagree strongly</th>
</tr>
</thead>
<tbody>
<tr>
<td>1: Early responders</td>
<td>36.0</td>
<td>40.0</td>
<td>18.7</td>
<td>5.3</td>
<td>0</td>
</tr>
<tr>
<td>2: Mid-responders</td>
<td>28.5</td>
<td>52.6</td>
<td>13.8</td>
<td>4.3</td>
<td>0.9</td>
</tr>
<tr>
<td>3: Late responders</td>
<td>49.3</td>
<td>39.9</td>
<td>7.7</td>
<td>3.0</td>
<td>0.2</td>
</tr>
</tbody>
</table>

Question 9: I believe the forensic science in crime fiction is true and accurate ($p<0.0001$).

<table>
<thead>
<tr>
<th>Tertile</th>
<th>Agree strongly</th>
<th>Agree</th>
<th>Neutral</th>
<th>Disagree</th>
<th>Disagree strongly</th>
</tr>
</thead>
<tbody>
<tr>
<td>1: Early responders</td>
<td>1.3</td>
<td>32.0</td>
<td>40.0</td>
<td>24.0</td>
<td>2.7</td>
</tr>
<tr>
<td>2: Mid-responders</td>
<td>0.9</td>
<td>30.4</td>
<td>51.3</td>
<td>14.8</td>
<td>2.6</td>
</tr>
<tr>
<td>3: Late responders</td>
<td>8.0</td>
<td>43.0</td>
<td>37.9</td>
<td>10.1</td>
<td>1.1</td>
</tr>
</tbody>
</table>

Question 10: I believe most writers take care to ensure the forensic science they use in crime fiction is true and accurate ($p=0.0152$).

<table>
<thead>
<tr>
<th>Tertile</th>
<th>Agree strongly</th>
<th>Agree</th>
<th>Neutral</th>
<th>Disagree</th>
<th>Disagree strongly</th>
</tr>
</thead>
<tbody>
<tr>
<td>1: Early responders</td>
<td>2.7</td>
<td>62.7</td>
<td>24.0</td>
<td>10.7</td>
<td>0</td>
</tr>
<tr>
<td>2: Mid-responders</td>
<td>5.3</td>
<td>61.4</td>
<td>26.3</td>
<td>7.0</td>
<td>0</td>
</tr>
<tr>
<td>3: Late responders</td>
<td>14.8</td>
<td>54.8</td>
<td>22.4</td>
<td>7.7</td>
<td>0.3</td>
</tr>
</tbody>
</table>
Question 13: If I find errors in the forensic science used in a novel, it affects my belief in all aspects of the novel (p=0.4806).

Response (%)  

<table>
<thead>
<tr>
<th>Tertile</th>
<th>Agree strongly</th>
<th>Agree</th>
<th>Neutral</th>
<th>Disagree</th>
<th>Disagree strongly</th>
</tr>
</thead>
<tbody>
<tr>
<td>1: Early responders</td>
<td>16.0</td>
<td>26.7</td>
<td>30.7</td>
<td>26.7</td>
<td>0</td>
</tr>
<tr>
<td>2: Mid-responders</td>
<td>9.0</td>
<td>36.0</td>
<td>31.5</td>
<td>22.5</td>
<td>0.9</td>
</tr>
<tr>
<td>3: Late responders</td>
<td>13.7</td>
<td>33.0</td>
<td>30.9</td>
<td>20.4</td>
<td>2.1</td>
</tr>
</tbody>
</table>

Question 14: Watching forensic TV programmes such as CSI has increased my expectation on writers to include forensic science in their novels (p=0.0003).

Response (%)  

<table>
<thead>
<tr>
<th>Tertile</th>
<th>Agree strongly</th>
<th>Agree</th>
<th>Neutral</th>
<th>Disagree</th>
<th>Disagree strongly</th>
</tr>
</thead>
<tbody>
<tr>
<td>1: Early responders</td>
<td>0.0</td>
<td>32.9</td>
<td>31.4</td>
<td>25.7</td>
<td>10.0</td>
</tr>
<tr>
<td>2: Mid-responders</td>
<td>5.6</td>
<td>29.9</td>
<td>32.7</td>
<td>27.1</td>
<td>4.7</td>
</tr>
<tr>
<td>3: Late responders</td>
<td>12.8</td>
<td>34.7</td>
<td>26.9</td>
<td>20.6</td>
<td>5.1</td>
</tr>
</tbody>
</table>

Question 15: I believe the accuracy of science written in a novel more than the accuracy of the science I see in a TV programme such as CSI (p=0.0052).

Response (%)  

<table>
<thead>
<tr>
<th>Tertile</th>
<th>Agree strongly</th>
<th>Agree</th>
<th>Neutral</th>
<th>Disagree</th>
<th>Disagree strongly</th>
</tr>
</thead>
<tbody>
<tr>
<td>1: Early responders</td>
<td>6.9</td>
<td>36.1</td>
<td>41.7</td>
<td>15.3</td>
<td>0</td>
</tr>
<tr>
<td>2: Mid-responders</td>
<td>8.1</td>
<td>39.6</td>
<td>39.6</td>
<td>11.7</td>
<td>0.9</td>
</tr>
<tr>
<td>3: Late responders</td>
<td>17.9</td>
<td>37.0</td>
<td>33.0</td>
<td>11.4</td>
<td>0.8</td>
</tr>
</tbody>
</table>