CHAPTER 1

Foundation knowledge in forensic odontology

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I'm not young enough to know everything.


Introduction

Forensic odontology has been variously described as ‘the application of dental science to the administration of the law and the furtherance of justice’ [1] and ‘that branch of dentistry, which in the interest of the law, deals with the proper handling and examination of dental evidence and the proper evaluation and presentation of such evidence’ [2] and ‘the overlap between the dental and the legal professions’ [3].

The dates of these references show us that forensic odontology has been developing as a specialist discipline for the last 50 or so years. Once the remit of the merely interested or community minded and conscientious, dentists now require rigorous training and commitment to practise within the profession. The discipline is recognised as a specialty of dentistry in a number of countries including Australia, and has a dedicated training stream within the Royal College of Pathologists of Australasia.

To the general community, forensic odontology is most frequently associated with personal identification of the deceased, and gains significant publicity at the time of disasters, natural or manmade, that claim many lives at a single point in time. The actual scope of practice of forensic odontology is considerably broader than this. In addition to human identification forensic odontologists are also involved in the examination and assessment of bite mark injuries, orofacial injuries following assault or trauma and child abuse injuries; age assessment of both living and deceased persons and civil cases involving malpractice and fraud allegations.

*Deceased
Practitioners must also have a sound working knowledge of dental anatomy and pathology; comparative dental anatomy; the natural sciences; legal system law and relevant legislation. An understanding of the activities and interactions of other forensic disciplines is also important in developing an appreciation of the scope and practice of forensic odontology.

On a personal level, forensic odontologists should have broad dental experience, a methodical and analytical approach with considerable patience and attention to detail. Personal honesty and integrity and emotional stability are vital. Good communication and interpersonal skills and the ability to work as part of a team, as well as autonomously, are important, as is the ability to formulate and articulate well-balanced views.

This text will work its way through current best practice in a number of these areas. It aims to support those undertaking training in forensic odontology in the development of their knowledge base, which forms alongside their clinical skills. The text is designed at the awareness level rather than aiming to be an exhaustive discourse. Contemporary excellent references are provided to extend reading beyond the introductory.

Recent reviews into the scope and reliability of all forensic evidence have seen an explosion of research and literature relating to improving the performance and professionalism of practitioners [4–6]. Recent rulings challenging admissibility of specialist evidence, recognition of specialist disciplines and the evidentiary weight of forensic evidence also highlight the need for continued research into aspects of practice and the need to establish and maintain high professional standards [7–9].

A short history of forensic odontology

Although it was reported that forensic odontology was used to identify victims of a fire in the Vienna Opera House in 1878 [10,11], the modern era of forensic odontology is said to have commenced with the identification of the victims of the Bazar de la Charité fire which occurred on 4 May 1897 in Rue Jean-Goujon, Paris. One hundred and twenty-six members of the Parisian aristocracy perished after an ether–oxygen film projector ignited a rapidly destructive fire. All but 30 of the victims were identified visually or by personal effects, mainly jewellery, on the day after the fire.

The honour of being the ‘father of forensic odontology’ is often bestowed on Oscar Amoedo, a Cuban dentist working in Paris at the time of the fire, but he did not in fact do any of the odontology work at this incident. The author of L’Art dentaire en Medecine Legale [12], which was a considerable text on many aspects of the use of teeth for legal purposes, merely reported the outcomes of the work done by other dentists after the fire. The credit for the idea of using dental information to assist the final identifications actually belongs to the
Paraguayan Consul, Mr Albert Haus. With the identification of the last 30 victims seeming almost impossible, Mr Haus suggested consulting the dentists who had treated the remaining missing persons. One of the unidentified victims was the Duchesse d’Alencon, who was a daughter of the Duke of Bavaria and sister of Elisabeth, Empress of Austria and Anne, Queen of Naples. A Dr Isaac B Davenport had provided dental services to the duchess and many of the other victims. He was apparently a trained botanist as well as a dentist and his detailed notes included excellent drawings of the dentition. He examined the majority of the remaining unidentified bodies and was eventually able to identify the duchess via her dentition. Subsequently, a number of other dentists were invited to examine the remains of the deceased, and eventually all but five of the victims were identified. The police accepted these dental identifications and released the bodies to the families [13,14].

Prior to the Bazar de la Charité fire, the most frequently cited examples of the use of teeth and dental work in the identification of the deceased were those of Lollia Paulina by Agrippina using visual recognition of ‘distinctive teeth’ in AD 49; Charles the Bold in 1477; General Joseph Warren by Paul Revere via a fixed wire silver bridge in 1776; Dr Parkman by Nathan Keep from the fit of dentures on study models in 1849 and Napoleon the IV in 1879 [14,15].

In 1954 Strom [16] reported that the use of teeth to aid identification in the modern understanding had in fact initially been proposed by Godon in 1887, but a report by M’Grath in 1869 [17] described the use of dental characteristics to differentiate between two incinerated females.


While these reports would appear to indicate that forensic odontology was well recognised as a discipline, Frykholm [22] did comment that both the German and Swedish authorities involved in his case report ‘reflected a certain disbelief’ about the value of forensic odontology, and that the assisting dentists
had no personal experience in forensic odontology prior to this case. It would be reasonable to assume that both appreciation of the value and experience in forensic odontology were varied across the globe, as can be expected with any relatively new and emerging area of knowledge and investigation.

Histories of forensic odontology acknowledge that the next significant publication after Amoedo was that of Gustafson in 1966 [11]. This comprehensive text covered principles of identification in single and multiple death situations, information that can be ascertained from the dentition, the responses of teeth and restorations to various traumas and the investigation of bite mark injuries. Although more than 40 years old, the text remain relevant for contemporary practitioners. Texts by Furuhata and Yamamoto [27], Luntz and Luntz [28], Sopher [29], Cameron and Sims [30] and Harvey [31], and an edition of the Dental Clinics of North America in 1977 soon followed, marking the arrival of a new specialist discipline within the field of dentistry. Professional associations relating to forensic odontology soon followed, for instance the Canadian Society of Forensic Odontology was formed in 1970 [32], the British Association of Forensic Odontology in 1983, the New Zealand Society of Forensic Dentistry in October 1985 and the Japanese Society of Forensic Odontology in 1988 [33], thereby exposing the discipline to larger numbers of interested dentists.

The American Society of Forensic Odontology formed in 1970 as a group open to any person with an interest in forensic odontology [15]. In 1976 the American Board of Forensic Odontology (ABFO) was incorporated under the auspices of the American Academy of Forensic Sciences to ‘establish, enhance and revise qualifications and standards’ and has developed a role as a certifying board of forensic odontologists [34]. This is the only international society to take on such a formal role.

The International Association of Forensic Odonto-Stomatology (IOFOS) held its inaugural meeting in Paris in June 1973 [35]. Membership was initially open to any individual with an interest in forensic odontology, and was not limited only to dentists. It has since grown to be a group where membership is country based, having 32 member countries in 2015, and is the organisation representing the majority of forensic odontologists internationally.

The only international journal dedicated to forensic odontology, The International Journal of Forensic Dentistry, was published from 1973–1977 and was the forerunner to the Journal of Forensic Odonto-Stomatology, which commenced publication in 1982 [35].

In Australia, The Australian and New Zealand Forensic Science Society was formed in 1971 with the aim of bringing together scientists, police, pathologists and members of the legal profession [36]. Dentists were, and still are, members of this group. Dentists with a special interest in forensic odontology formed The Australian Society of Forensic Dentistry, now known as The Australian Society of Forensic Odontology (AuSFO) in 1984.
Forensic odontology in Australia

Pounder and Harding [37] reported that the first autopsies were conducted in Australia in 1790, one on a victim of inanition (starvation) and the other on the governor’s gamekeeper who was allegedly murdered by Aborigines. Pounder [38], reporting on death investigations in the early years (1839–1840) of South Australia, indicated that both the coroner and jurors were required to view the body of the victim as part of the inquest procedures. Although the stated purpose was for the examination of marks of violence, it could also be surmised that it was also for the formal identification of the victim. This practice remained until 1907. Cordner, Ranson and Singh [39] indicated that the first lectures on forensic medicine were held in Melbourne in 1866.

It is not really known when forensic odontology was first used in Australia. A report in the New South Wales Police News in 1943 reported the identification in Melbourne, Victoria of a murder victim, Bertha Coughlin, in 1923 and of Norman List in 1924, using dental evidence [40]. This article also mentioned that the identity of three victims of a plane crash in the Dandenong Ranges in 1938 ‘could only be established by means of the teeth’. Cleland [41] mentioned the identification of a New Zealand citizen in Western Australia in 1930, although this identification appeared to rely more on circumstantial dental evidence than true dental identification.

The most famous identification case from that era occurred in New South Wales in 1934. Colloquially known as the Pyjama Girl Case, the outcome highlights the value of dentistry in identification, but also the pitfalls that can derail the well intentioned but ill prepared, dental practitioners and investigating police officers. It involved a murdered woman who remained unidentified for 10 years, ostensibly due to unreconciled dental information. The badly burned remains of the victim were discovered by a farmer in a road culvert near Albury in September 1934. The body was clothed only in pyjama remnants and revealed little other identifying information. A post-mortem was carried out and a local dentist, Dr Francis Jackson, was asked to complete a dental autopsy. His unorthodox procedures can best be explained by his inexperience in forensic odontology, but mitigated by the fact that few people had any experience at that time. At the subsequent Supreme Court trial he admitted that this was his only experience of forensic odontology and he found the process ‘revolting and unnerving’ [42, 43].

Dr Jackson’s unconventional examination occurred over three visits. On the first he made some observations and extracted two teeth, on the second he extracted an additional four teeth and on the third he took upper and lower impressions of the jaws. The extracted teeth were then mounted into the stone dental models made from the impressions ‘in approximately the same position as they were in the mouth’. During the course of these examinations Dr Jackson incorrectly identified one tooth and failed to observe restorations in two other teeth. These inaccuracies proved pivotal in the inability to identify the remains.
for 10 years. Photographs of the casts with the extracted teeth in situ were distributed to dentists in Australia and New Zealand, and every dentist in metropolitan Melbourne and Sydney was personally contacted by police. Information about this case, including images of the extracted teeth, was also displayed as ‘ads’ in movie theatres. Unsurprisingly, none of these activities yielded any useful information.

The police relied on public appeals to attempt to identify the victim. Apparently over 500 women who had been reported missing were located in the course of the investigation. Ultimately the remains were preserved in a formalin bath, and it became quite a social outing to visit ‘the body in the bath’ at Sydney University. Many false identifications were offered to police from these viewings. About nine months after the victim was found, police interviewed a man, Antonio Agostini, whose wife Linda had been reported missing by a family friend. This gentleman indicated that he did not recognise the lady in the bath, but provided police with the details of his wife’s dentist.

The information provided by this dentist did not match the post-mortem information provided by Dr Jackson and the investigation continued. Interestingly, the dental information provided by the treating dentist was also somewhat unorthodox. It transpired that he kept no formal clinical records and the information he provided was an amalgamation of personal recollection and ledger entries of fees paid. This information would be legally inadmissible today.

In 1944 new investigating officers decided to review all the information relating to the case and asked another dentist, Dr Magnus, to re-examine the body. Dr Magnus was more thorough in his work, correctly identifying all the teeth and locating previously unobserved restorations. On comparison the new charting matched the ante-mortem dental information of Linda Agostini. Antonio Agostini subsequently admitted to having murdered his wife in 1934 [42, 43].

This case highlights the importance of experience and procedure in forensic odontology, the value of comprehensive clinical records and attention to detail during the collection of post-mortem information. Despite this recognition it still took a number of years before formal services in forensic odontology were established in Australia. Interestingly, this development followed a similar path in most states and territories. From around the early 1960s there was spasmodic use of dentists to assist police in identification procedures. This was generally an informal arrangement with little or no remuneration, which meant that the dentists providing the services frequently had to complete examinations and prepare reports after hours and at weekends. In the vast majority of cases a single practitioner provided the entire service. Limited training in forensic odontology was available to these dental practitioners and it is a credit to their dedication and professionalism that the discipline has developed to the high standard and international reputation it enjoys today.

Dr Gerald (Gerry) Dalitz provided the early forensic odontology services in Victoria from the 1950s. In 1961 he was awarded a Doctor of Dental Science for
a thesis entitled ‘Some aspects of dental science – Identification of human remains’ by the University of Melbourne. While collecting data for his research his expertise came to the attention of the Victoria Police and they slowly began utilising his services. Dr Ross Bastiaan started working with Dr Dalitz in 1979, continuing until 1989. Professor, then Dr, John Clement arrived from the UK in 1989 to take up a position in the dental school at the University of Melbourne. Professor Clement had considerable experience in forensic odontology and had worked on a number of mass fatality incidents including the Free Enterprise at Zeebrugge in 1987. Upon arriving in Melbourne, Professor Clement was instrumental in establishing a broader and more professional forensic odontology service in Victoria, including the introduction of the first graduate training program and the only Chair in Forensic Odontology in Australia [44].

In New South Wales the Chief Dental Officer, Dr Norbert Wright, together with Drs Max Bullus, John Wild, Sydney Levine and Barry Barker provided the odontology services on a similarly informal basis. It was not until 1981, when Associate Professor Griffiths completed a Masters in Public Health relating to Disaster Victim Identification and took up a position at Westmead Hospital, that forensic odontology was formally recognised and funded through the New South Wales Health Service [44].

In South Australia, Dr Kenneth Brown’s interest in forensic odontology was sparked in 1961 when he attended a lecture entitled ‘Dental aspects of forensic medicine’ presented by Professor Gosta Gustafson who was the Professor of Oral Pathology at the University of Lund in Sweden. In 1967 he responded to a request by the South Australian Police Department who were looking for volunteer dentists to provide them with dental expertise. Dr Brown read widely, but as there were no formal training programs in Australia at the time, he used a Churchill Fellowship in 1976 to travel internationally to increase his knowledge and experience in the field of forensic odontology. His honorary work for the South Australian Police continued until a formal post in forensic odontology, the first such position in Australia, was created at the University of Adelaide in 1980. Drs Jane Taylor (2000–03) and Helen James (2004–present) have succeeded Dr Brown as leaders of this unit [44].

Pocock, in his 1979 paper on the provision of a forensic pathology service in Western Australia [45], commented that a part-time forensic odontologist was ‘available for consultation in any problem of identification’. This position had been established in the early 1960s and was held by Dr Frank Digwood, and became a formal part-time position in the 1980s. Dr Stephen Knott provided assistance to Dr Digwood from 1991, and succeeded him on his death in 1993 [44].

Dr Kon Romaniuk moved from New Zealand to take up a position in the dental school at the University of Queensland as an oral pathologist in the mid 1960s. As appears typical for most developing services in Australia, he provided an honorary consultation service in forensic odontology, later establishing a more formalised arrangement that provided a modicum of remuneration. Dr Alex
Forrest started working as an assistant to Dr Romaniuk in 1985, and became the consultant forensic odontologist in 1994 after a traffic accident necessitated Romaniuk’s retirement [44].

Early forensic odontology services in Tasmania were by Dr Eric Canning MBE, a non-practising dentist who worked in the anatomy department at the University of Tasmania. Dr Paul Taylor has provided these services since 1989 [44].

It is believed that early forensic odontology services in the Northern Territory were provided by Dr T. Paul Boyd who worked part time as an oral surgeon in the public health system. Dr John Plummer had an interest in forensic odontology from his undergraduate years but his first exposure came in the late 1970s when he was the government dentist in Katherine and was asked to help identify a family who had drowned after a flash flood had washed away their homestead. Dr Plummer continued his professional development in forensic odontology by using a Churchill Fellowship, awarded in 1985, to travel extensively and meet and work with a number of forensic odontologists internationally. As a health service employee Dr Plummer continued his involvement in forensic dentistry on an honorary basis until his retirement in 2002, which proved satisfactory as the caseload in the Northern Territory was not large [44].

The Australian Capital Territory was the last of the Australian jurisdictions to establish any regular service in forensic odontology, and this occurred as a consequence of poor identification procedures in a murder that led local dentist Dr David Griffiths to develop an interest, undertake some training and offer his services [44].

Also quite interestingly, all states and territories in Australia have experienced major incidents which required the services of forensic odontology and which served to increase the profile of the emerging discipline across the country.

The Ash Wednesday bushfires of 1983 claimed 47 lives in Victoria: 14 of the 22 (64%) Victorian victims who could not be visually recognised were identified via forensic odontology [46]. Forensic odontology now forms a routine part of single and multiple death investigations in Victoria, including the Kew Cottages Hostel fire in 1996 (nine deceased); the Linton bushfires in 1998 (five deceased); a light plane crash at Myrrhee in 2002 (six deceased); the Mt Hotham plane crash in 2005 (three deceased); a car accident at Donald in 2006 (eight deceased); the Kerang train crash in 2007 (nine deceased); the crash in the Burnley Tunnel in 2007 (three deceased); and in a major national Disaster Victim Identification (DVI) incident, the Black Saturday bushfires of 2009 that claimed the lives of 174 people [44].

The Grafton bus crash in 1989 highlighted the limitations of visual identification and changed identification practices in New South Wales. One of the 21 victims of this accident was initially incorrectly visually identified, so when just over two months later 35 people were killed in a collision between two buses near Kempsey, forensic odontology was used to identify the majority of the victims. Subsequently, forensic odontology has been used as part of the identification repertoire in all mass fatality incidents in New South Wales including
the Newcastle earthquake in 1989 (13 deceased), the Thredbo landslide in 1997 (19 deceased), the Glenbrook train accident in 1999 (seven deceased) and the 2003 Waterfall train disaster (seven deceased) [44].

The largest mass fatality incident in the recent history of South Australia was the ‘Ash Wednesday’ bushfires of 1983. Twenty-eight South Australians lost their lives in fires in the hills surrounding Adelaide and in the south east of the state near Mount Gambier. This incident saw the first activation of the newly written State Disaster Plan. Eight (29%) of the South Australian victims were identified by dental comparison [47]. Subsequent to this South Australia seemed to develop a national reputation as the locale for bizarre murders with the victims of many of these incidents being formally identified by forensic odontology, including the Truro murders in 1978 (seven victims) [48–50], the Family Murders over the period of 1979 to 1983 (five victims) and the Snowtown murders in 1999 (11 victims) [44].

One of the earliest incidents of significance for the recognition of forensic odontology in Australia occurred in Western Australia with the crash of a Viscount aircraft in Port Hedland in 1968. Dental comparisons played a significant role in the identification of the 29 victims. Forensic odontology provided the identification for eight of the 10 victims of the 1982 Merredin bus crash, and seven of the 10 victims of the 1988 Leonora plane crash, and was important in the identification of the victims of the Gracetown Cliff collapse which killed 18 teenagers in 1998 [44].

Significant incidents in Queensland have included the crash of two Blackhawk helicopters near Townsville in 1996 (15 deceased), the Childers Backpackers Hostel fire in June 2000 (15 deceased) and the Lockhart River plane crash in May 2005 (15 deceased) [44].

While the Mt St Canice Boiler explosion in September 1974 (eight deceased) and the Tasman Bridge collapse in January of 1975 (12 deceased) were major incidents for Tasmania, it is the Port Arthur massacre of 1996, where Martin Bryant shot and killed 35 and wounded 19, that stays in the national memory. Three of these victims were subsequently burnt beyond recognition in a fire set by the gunman in a nearby guest house where he had held them hostage overnight. The identification of these three victims was assisted by odontology evidence. The fire was so extensive and intense that almost 30 kilograms of debris was collected during the recovery of the bodies to ensure all possible remains were located. One body was so severely incinerated that only fragments of both jaws and a few teeth were able to be located. Two of the victims wore dentures, one a full upper against some remaining lower natural teeth, the other full upper and lower dentures. One full upper denture survived the conflagration. Dental and medical radiographs of the head area were instrumental in confirming the identification of these victims [44, 51].

Although the Northern Territory has not experienced many mass fatality incidents, one of Australia’s largest did occur in Darwin. Cyclone Tracy, which struck on Christmas Eve in 1974, resulted in the death of 71 people. While it is believed
that those who were recovered at the time of the cyclone were identified visually, a number of victims who were recovered in later years were identified via forensic odontology. All 13 victims of the collision of two hot air balloons over Alice Springs in 1989 were also identified via dental comparison [44].

Covering a small geographic area, the Australian Capital Territory has not experienced many multiple fatality incidents. Incidents such as the 1991 plane crash in the Brindabella (four killed) and the 1993 MIG crash at Canberra airport were coordinated and managed by the Search and Rescue division of the Australian Federal Police ACT with identifications being completed via dental comparison [44].

Dr Anthony Lake of South Australia has completed a comprehensive history of forensic odontology in Australia which can be accessed on the Australian Society of Forensic Odontology website http://www.ausfo.com.au.

**Forensic odontology in New Zealand**

The contemporary history of forensic odontology (as it is now known) in New Zealand began in 1946 and has been well documented by Churton (Fig. 1.1) [52]. The first recorded use of dental identification of deceased individuals in this country came in 1946, after the end of the Second World War, when Lt Col O.E.L. Rout RNZDC was tasked with the formal identification of the New Zealand war dead. Most of these individuals had perished in battlefields across North Africa, Italy, Europe and the Pacific and many had been buried where they fell. Correct identification of the exhumed remains was important prior to re-interment in official war cemeteries.

![Fig. 1.1 Dr Maurice Churton.](image)
Rout noted that dentists were not always present when bodies were recovered, so he wrote a very detailed document entitled ‘Posthumous Dental Identification’. This document was used with great success by the lay personnel of the Graves Registration Units (GRU). Churton remarks that, surprisingly, there is no mention of Rout’s work in Brooking’s text, *A History of Dentistry in New Zealand* [53].

The Tangiwai Bridge rail disaster on Christmas Eve, 1953 (in which 151 people died) prompted a concerted effort in this country to establish forensic odontology as a permanent, scientific discipline. Some of those killed were recent arrivals to New Zealand who had no relatives and no local medical or dental records to help in their identification. Of the dead, the bodies of 20 were never recovered and may have been washed out to sea [54]. Of the bodies that were found, some were initially misidentified and 21 others were eventually buried unidentified in a common grave at the Karori Cemetery in Wellington [23].

Subsequent disinterment of these remains was undertaken in April 1954 and 16 of these bodies were identified, nine by dental means. The dentists involved were Dr G. McCallum and Dr O.E.L. Rout.

Churton [52] stated that these events were the catalyst for the development of forensic interest by the profession. In particular, Associate Professor Frank Shroff, from the University of Otago School of Dentistry, took up the challenge.

Professor Shroff gave a paper on dental identification at a Christchurch dental conference in the mid 1950s and subsequently produced a 28-page document entitled ‘Procedure for the examination of human remains for the purpose of identification’ in 1954. The intention was to have police print and distribute this procedure manual to the profession and to selected pathologists. In addition, bulk supplies were to be held at various police centres and made available in the event of a major disaster.

In 1958, negotiations began between the New Zealand Dental Association (NZDA) and various government agencies to print the manual. NZDA members were canvassed to determine which practitioners were interested in being involved in this field of practice.

Despite the continued endeavours of Professor Shroff, a plan for printing and distribution of the manual and the establishment of a national forensic dental practitioner group did not progress until the procedure manual was eventually published as a hard-backed booklet in 1968. The manual was printed and distributed to a number of police districts.

In 1963 another incident rekindled interest in forensic dentistry. On 3 July 1963, a DC3 passenger aircraft with 23 people on board crashed into a vertical rock face in the Kaimai Ranges near Matamata, while on a flight from Auckland to Tauranga in poor weather. All on board died and four of the bodies were never recovered.

Of the 19 bodies recovered from the crash site, 13 were identified on the basis of dental evidence [55]. The forensic dental examinations of the recovered bodies
were undertaken by Dr Colin Powell and Dr Edward Blair, both from Hamilton. This disaster helped cement forensic odontology in the consciousness of the New Zealand Police.

During the mid 1960s, the national discussion revolved around the labelling of dentures and the desirability for dental practitioners to retain radiographs for extended periods of time.

In 1966, two homicides in Auckland (the Soutter and Harvey killings) once again galvanised the attention of the profession and police. In both cases, an extended post-mortem interval made it difficult to identify the victims by what were considered to be conventional means at the time. The dentists involved were Professor Shroff, Dr Euan Moore and Dr Robert Max. For the first time in this country forensic odontology became a significant player in criminal investigations.

Meanwhile, discussions and correspondence between the police and the dental profession continued on two levels.

On the one hand, while the NZDA was communicating with police hierarchy, concurrent private correspondences were being conducted between individual members of both organisations. This resulted in confusion and stalled progress.

Professor Shroff advanced his strongly held view that one practitioner, specifically trained in forensic odontology, should be appointed for each island to assist police with such matters as homicides and accidents. He also foresaw the need for a larger group of dentists to deal with disaster situations.

On the other hand, Dr Moore supported the appointment of one or two dentists in each major centre, who would act as a ‘link’ between the profession and police.

Churton [52] observed that the entire thrust of discussions became focused on one aspect of forensic odontology – namely, the identification of the dead. That such should be the case is perhaps understandable, but even so it was unfortunate, because it imposed limitations on the role of dentistry and denied the police, and through them the community, the full range of expertise potentially available through the profession. This narrow perception of forensic odontology persists today, even among some who are involved in the provision of these services.

It was eventually decided by the NZDA that each of its various branches would be asked to put forward recommendations of those ‘interested in forensic dentistry’ for subsequent appointment to a nation-wide team. Those nominated were to have 10 years’ experience in practice. The proposal outlined was that this group would be trained in court and police procedures and receive basic training in post-mortem methods, forensic medicine and certain relevant laboratory skills. In addition, each appointed dentist would be required to report annually to the NZDA, at which time the appointments would be re-affirmed.

This course of action was approved by the NZDA in 1967. In 1968 a panel of 19 interested practitioners (one for each police district) was appointed, chaired by Dr Moore. The stated intention was not only to train this group for their roles in their individual communities, but also for their secondary, but no less important, role as a national dental forensic team capable of dealing with major disasters.
Unfortunately, few of the proposals regarding education, training and reporting came to fruition. A seminar involving Auckland members, police and medical personnel was held in 1969, but this appears to have been the only one of its type. Literature was not circulated and no formal educational seminars were held. Indeed, only one was proposed – to be given by Professor Shroff in Dunedin; but this had to be cancelled due to a lack of support. The only formal education included as part of the dental undergraduate course at the time was delivered by Professor Shroff as part of the oral pathology curriculum. This ceased when he retired from the School of Dentistry in 1974.

From 1969 until the Erebus disaster in 1979, the national panel barely functioned. At a local level, some panel members were involved with police while others were not. It would appear that the level of activity depended not so much on the expertise of the individual practitioner, but more on the whims of the constabulary as often the practitioner of the victim would be called rather than the nominated panel member. A further problem revealed by the passage of time was the cyclic transfer of senior police contacts. This often broke the invaluable personal contact and the dental panel member would be repeatedly faced with re-establishing his credibility and acceptability to the police replacements. Finally, in some areas, another trend began to emerge. With increasing frequency, full-time hospital-based dental officers became involved in identifications at the request of the police. Whilst this may have given a degree of flexibility to the police, it was certainly not looked upon as an encouraging development by those members of the profession outside the hospital dental service who over the years (often at significant personal sacrifice) had been involved in police matters. Throughout this period, although individual practitioners, panel members and others were involved with homicide investigations, aircraft crashes, fires, drownings, and the like, the emphasis was always on post-mortem dental identification rather than forensic odontology.

The result of this lack of organised activity, together with piecemeal utilisation of panel members and a dearth of formal education in forensic odontology, was inevitable – the panel ceased to exist as a functional entity. The fact that some of its members continued their involvement was a tribute to their professional dedication and personal motivation rather than a reflection of any encouragement received. This situation continued unaltered until the Erebus disaster in 1979.

On 28 November 1979, an Air New Zealand DC10 aircraft crashed on Mount Erebus in Antarctica with the loss of 257 passengers and crew. At the time of writing, this disaster ranks as the worst disaster the country has ever suffered. The weeks that followed saw the recovery of bodies from Antarctica, their transportation to Auckland and the successful identification of 213 victims. The dental team consisted largely of Auckland practitioners with no experience in DVI. The result achieved by the 10 dentists involved had a major impact on the overall success of this DVI operation with identification by dental means accounting for approximately 60% of all of the identifications achieved.
The Erebus debrief, to which not all who had been involved in the dental DVI team were invited, should have provided an opportunity to propel forensic odontology into a new era in the 1980s. Unfortunately, this opportunity was missed and the school of thought that carried the day was that the coordination of future operations of this type should be left to senior clinicians in the hospital dental service. The reasoning for this was that it was better to have an ‘office’ rather than an individual as the first point of contact for police. Furthermore, Auckland was proposed as the obvious place to deal with large numbers of disaster victims. To support this view, it was suggested that private dental practitioners could not be expected to be involved in major disaster victim identification operations because of the attendant financial losses and disruption to their practices.

This decision was made despite the fact that the majority of those involved in Erebus and the prior DVI operations were in private practice (either part time or full time) – a state of affairs that has continued to apply through to the present day.

These proposals and others were discussed with a senior police officer and as a result a report was presented to the Council of the NZDA. In line with these proposals, a plan agreed to by both the police and the dental profession was put in place to deal with future disaster situations. By 1983, the wheel had turned a full circle as the NZDA once again requested the names of those wishing to be involved in forensic work.

Churton concluded his history (to 1983) by lamenting the fact that forensic odontology had not become firmly established in New Zealand. He proposed five reasons for this failure.

1. The profession and the police had failed to appreciate the real meaning of forensic odontology. Rather, the term had become synonymous with the identification of the dead by dental means. While this latter skill had been, and will always remain, an important aspect of the subject, it must be fully appreciated that it is only a part and not the whole.

2. Despite several resurgences of interest due to large-scale or high-profile events, the groundswell of enthusiasm had not been capitalised on prior to 1983. The result was a loss of interest and enthusiasm.

3. The profession failed to heed and properly utilise great teachers such as Frank Shroff and R.M.S. Taylor.

4. A flawed decision-making process whereby, over the years, decisions of ever-increasing importance have been made without full and free discussion and without the involvement of many of those with a proven interest in, and knowledge of, this topic.

5. A flawed method of appointments. It is a fundamental tenet that all professional appointments in clinical fields should be made as a result of properly described and advertised job descriptions. It is unacceptable that a particular individual is *ipso facto* the most suitable person for a position simply because he or she holds an unrelated appointment.
In December 1983, a request was made by Dr Churton to form a special Society of Forensic Dentistry under the aegis of the NZDA. Approval was immediately forthcoming. On 22 June 1984, the first meeting of the New Zealand Society of Forensic Dentistry (NZSFD) was held in the Conference Room of the Freyberg Building at Wellington. For the first time, all those with an interest or involvement in forensic matters had the opportunity to participate in a formal society for mutual benefit and advancement of knowledge. The previously conflicting approaches of Shroff and Moore were finally reconciled.

The new society began with an enthusiastic membership of 16 and elected the inaugural president – Dr Maurice Churton (Fig. 1.1), who was subsequently re-elected for a further two terms. Dr Churton is regarded as the ‘father of the NZSFO’. A list of presidents and secretary/treasurers is given in Table 1.1.

The constitution of the Society refers to its objectives as to:

- Foster and coordinate and advance forensic odontology howsoever and to inter alia hold conferences of high scientific merit.
- Seek and maintain association with the International Organisation of Forensic Odonto-Stomatology (IOFOS) and the New Zealand Dental Association Incorporated.
- Pursue and advance the recognition and acceptance of the practice of forensic odontology within the fields of forensic science and odontology, and to establish high professional and clinical standards for the practice of forensic odontology.
- Stimulate interest in forensic odontology generally, and to establish liaison with organisations with kindred interests.
- Raise money.
- Publish literature.
g) Enlist support of government and any other appropriate organisation or group.

h) Give advice on matters related to forensic odontology.

i) Do all such things as are incidental or conducive to any of these objectives and, as such, are necessary or desirable to encourage, directly or indirectly, the attainment thereof.

The NZSFD became the vehicle for a forensic voice of the dental profession and a motivator for its members. A conscious decision was made at the outset to bring acknowledged overseas experts in forensic dentistry to its meetings – a decision which proved invaluable. Annual conferences have been held every year, and attendance numbers have steadily increased.

In the 30 years of its existence, the membership of the society has grown to a present day number of 89, as per Table 1.2. This healthy membership arises as a result of a collegial spirit of support and the free sharing of knowledge and experience.

While society membership was initially comprised exclusively of dentists and dental specialists with no formal qualifications in forensic odontology, interest was such that, in 1990, two members sought training overseas and both Drs Denis Beale and Zaf Khouri returned with Graduate Diplomas in Forensic Odontology – the first practitioners in New Zealand to have formal training in the discipline. They have since been joined by several others with similar qualifications and yet others who have undergone other forensic training.

In 1991, after discussions between the NZSFD and the New Zealand Police and subsequent advertising for applicants, the New Zealand police appointed six regional advisors on forensic dentistry. This system worked well for a few years, but suffered the same fate as the previous attempts at formalised police involvement in the 1960s, 1970s and early 1980s, and for the same reasons. A national advisory panel to police was then convened, but this also failed in short order.

The 1990s ticked along unremarkably, with a good representation of casework being reported at the NZSFD annual meeting each year. During this period, the society appointed seven regional coordinators to act as first contact points for police and anyone else who wished to access the services that society members could offer.

In 1996, Professor Jules Kieser was appointed to the Chair and Head of the Department of Oral Sciences and Orthodontics at the University of Otago in Dunedin.

Table 1.2 Membership of the NZSFD.

<table>
<thead>
<tr>
<th>Year</th>
<th>Status</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1984</td>
<td>Full members</td>
<td>16</td>
</tr>
<tr>
<td>2014</td>
<td>Full members</td>
<td>56</td>
</tr>
<tr>
<td></td>
<td>Associate members</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>Overseas members</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Honorrary members</td>
<td>6</td>
</tr>
</tbody>
</table>
He promptly joined the NZSFD in 1997 and was elected onto the Executive of the Society in 2000, subsequently becoming president in 2008. Professor Kieser was instrumental in bringing to the profession all that Professor Shroff before him had aspired to achieve – scientific rigour touched with human kindness.

Formal teaching in forensic odontology became part of the undergraduate curriculum again, and through his enthusiasm and engagement with students, Professor Kieser lifted the forensic consciousness of the dental academic community to new highs. In 2009 he was appointed as the inaugural director of the Sir John Walsh Research Institute and continued to inspire and lead undergraduate students and postgraduate research. Through his research, his teaching, his comradeship and his leadership, Professor Kieser contributed much to the knowledge, training and promotion of forensic odontology in New Zealand. He remained an active, contributing and highly respected member of the Executive of the NZSFO until he passed away on 10 June 2014.

In 2005, the National Forensic Pathology Service was launched. This service employs seven full-time and experienced forensic pathologists based in Auckland, Palmerston North, Wellington and Christchurch, who provide 24/7 national coverage for all suspicious deaths and homicides as well as regional coverage for routine coronial deaths. They also provide a support service to coronial pathologists (laboratory-based anatomical pathologists) for all complicated and infectious cases [56].

The net effect of this on forensic odontology was profound and immediate. Casework in the ‘regional centres’ dropped dramatically (because the forensic pathology was no longer being carried out in the regional hospitals), while casework in the main centres increased.

Through the NZSFO, this situation was addressed by way of an internal understanding whereby practitioners in the main centres, upon receiving forensic cases from other areas, agreed to offer these cases back to the Regional Coordinator for the geographic area of origin. In this way, an equitable distribution of casework was ensured so that all members could remain actively involved in forensic odontology and continue to develop their knowledge and experience.

On 29 August 2006, the new Coroners Act 2006 received royal assent and came into effect on 1 July 2007, repealing and replacing the previous Coroners Act 1988. This established the office of a chief coroner and a series of full-time coroners and saw the end of an ad-hoc coronial service with many part-time coroners spread all over the country.

The main function of the chief coroner is to ‘ensure the integrity and effectiveness of the coronial service provided for by the Act with the objective of raising the professionalism of the coronial service and to promote consistency of the coronial practice throughout the country in a timely and efficient way whilst respecting the rights and interests of the bereaved’.

District Court Judge Neil MacLean was appointed the first chief coroner of New Zealand and took up his new position in February 2007. He soon became
closely associated with the NZSFD and has attended and spoken at several annual meetings. The chief coroner has had valuable input into the development of this society and some of its core policies.

The relationship with New Zealand Police on a national level is strong, thanks mostly to the tireless work of Drs Warren Bell and Hugh Trengrove. The National DVI team includes a permanent NZSFO representative. The society now has an agreed range of fees for identification cases, odontology opinions and bite mark analysis and this is reviewed by the society from time to time. There are brief descriptions of selected forensic odontology procedures in the Police Manual and also key contacts for advice. There are contacts on the police intranet available for police officers nationwide to access at any time. The society website (www.nzsfo.org.nz) also has a list of regional advisors and their contact details that is freely available to anyone wishing to contact us. At the time of the 2004 Asian Tsunami, the society negotiated an overseas deployment contract with police. This document is currently being re-negotiated.

In 2009, on its 25th anniversary, the society changed its name to the New Zealand Society of Forensic Odontology (NZSFO) - to better reflect the nature of the discipline and to remain in step with international practice.

In 2011, after several years’ hard work, much consultation and many drafts, a credentialing [57] framework was put into place, authored principally by Dr Hugh Trengrove. Credentialing relates to an individual’s competence to work in a particular subject area (scope of practice). This provided a mechanism for the NZSFO to provide governance and oversight for forensic odontology activities in New Zealand, in the absence of Dental Council recognition of forensic odontology as a dental speciality. The purpose of credentialing is to provide assurance concerning the competence of personnel performing forensic odontology activities. Currently, the defined scopes of practice include General Forensic Odontology, Forensic Odontology Extended Scope – Bite Marks, Forensic Odontology Extended Scope – Disaster Victim Identification, General Forensic Odontology Scope of Practice – Allied Practitioner and Forensic Odontology Extended Scope – Forensic Auxiliary Procedures.

Credentialing has had a significant impact on how forensic odontology is perceived by police and coronial users of our services. This has resulted in increased confidence in members who are credentialed and a better understanding of why a mechanism to monitor competence is important.

The early 21st century has seen New Zealand forensic odontologists contribute to the identification efforts following a number of significant disasters (as well as the steady stream of sporadic casework). Teams were deployed to Phuket, Thailand after the Boxing Day 2004 Asian tsunami, to assist our Australian colleagues after the Victorian ‘Black Saturday’ bushfires of February 2009 and after the Christchurch earthquake in February 2011. It is fair to say that, due to education and training, largely through the NZSFO, New Zealand is internationally regarded as a leader in disaster victim identification.
Despite the healthy state of membership of the society, it is interesting to observe that, while many things have changed, much remains the same. In the 1950s and 1960s, Professor Shroff lamented the lack of understanding about what forensic odontology can offer – both within organised dentistry and in police circles. He was a firm believer in formal training and education and, on a number of occasions, stated that a simple interest in forensic odontology was unacceptable as a qualification to undertake the work. Dr Churton was of the same view, and this was a major factor in his drive to establish the NZSFD. Dr Churton noted that police seem to be singularly interested in identification of the dead while disregarding, out of ignorance, the wealth of other assistance available to them. He also remarked on the cyclic frustration of ‘educated’ senior police moving on and leaving behind a vacuum of knowledge and experience so that forensic odontologists have to start all over again with building relationships.

The recurrent wax and wane of topics such as retention of records, denture marking and universal baseline dental charting in general dental practice continues. Other perennial subjects of discussion are our relationships with police, pathologists and coroners. All these will need to be addressed through our society if progress is to be made.

Where to from here? The future of forensic odontology in this country lies with the NZSFO. This organisation is firmly established as the authoritative voice of the discipline in this country. It is critical, however, if the frustrations of the past are to be avoided in the future, that the society takes a proactive approach to advancement. This will involve recognition by our members that forensic odontology is not merely identification of the dead by dental means. It will require a continued commitment to (and investment in) training and, for some, the pursuit of formal postgraduate qualifications. It will necessitate continued engagement with police, coroners and other healthcare professionals and building increasing awareness and closer relationships with them. It will involve the collegial sharing of information and knowledge among ourselves and with these other groups. Contentiously, it will also mean the establishment of formalised professional standards and a mechanism for policing those standards while maintaining the supportive, inclusive and enabling principles upon which the Society was founded and its credentialing process enshrines.

**Working as an odontologist**

One important aspect of forensic work is the physical and emotional toll it can take on an individual. This is as much the case for those contemplating a career in the forensic area as it is for those already involved. Exposure to the deceased, either in routine forensic casework or in the disaster situation, is an understandably stressful experience. In addition, much of the casework of the odontologist is often the result of traumatic circumstances, which seem to amplify the less desirable side of human nature. The work environment can be physically challenging. Practitioners
need to be aware of the potential impact on their health and actively check in on their mental and physical wellbeing at regular intervals.

Jones [58] surveyed 225 US Air Force personnel who were involved in body movement and identification subsequent to the Jonestown mass suicide in 1978: 32% of respondents reported feeling anxious and depressed immediately after the mission, and for 21% these symptoms continued long term. Those most severely affected were reported to be younger (less than 25 years of age), African American and had a higher level of direct exposure to the remains of victims. Ursano and colleagues [59] reported that identifying with the deceased, particularly as a friend, increased the risk of Post Traumatic Stress Disorder (PTSD) amongst the disaster workers.

McCarrol and colleagues [60] looked at the post traumatic stress experienced by forensic odontologists after the Waco, Texas siege in 1993, where 85 Branch Davidian sect members were incinerated. They found that higher levels of stress were directly related to longer periods of exposure, younger age, less previous disaster experience and the level of personal support. Epstein, Fullerton and Ursano [61] reviewed 355 workers for an 18-month period after their involvement in the air crash at the Ramstein Airshow in 1988. The crash killed 70 and injured many more. They found that lower levels of education, personal exposure to those affected by gross burns, a feeling of numbness and stressful personal circumstances in the six months following the accident were useful indictors for PTSD. Brannon and Kessler [62] commented that stress experienced by DVI practitioners is frequently not reported as it tends to be covert or silent. They concluded from their personal experiences in 10 disasters, that stress was less of a problem for older, more experienced practitioners. These comments were reinforced by Perrin and colleagues [63] who reported that PTSD in workers at the World Trade Centre disaster in 2001 was more likely to occur in those with no or limited prior experience or training. PTSD experienced among disaster rescue workers is 10–20% in the first year after the disaster [64]. This is perhaps reasonably logical, but of little comfort for the new and enthusiastic to forensic odontology.

References

8 Supreme Court of South Australia. (2013) *R v Sumner; R v Fitzgerald* SASFC 82.