FIREPOINT

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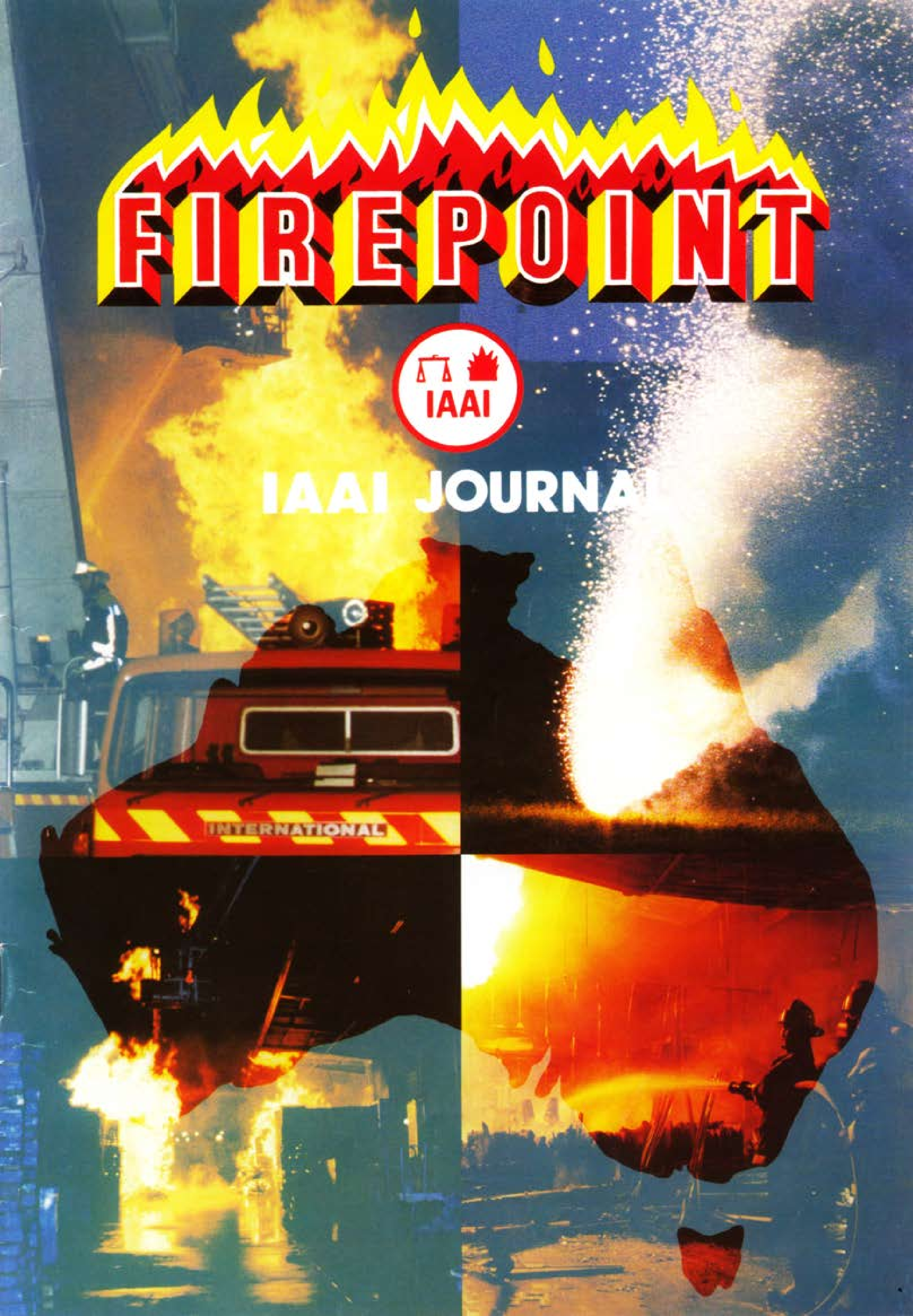

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EDITORIAL

To wind up the year we present a major Review by Chris Lennard of advances in fire cause determination over the past four years. It shows that there have been major advances, but much still needs to be learnt about fires, and the damage they cause.

And we close the magazine with some pictures from NSW, in place of the usual wordy report.

Best wishes to all members for a happy holiday season, and a prosperous New Year.

Our first edition in 1999 will detail the winning entries for the $250 cash prizes we offered. *Someone will be off on a winning note.*

Wal Stern

CONTENTS

Vol. 9, No. 4, December, 1998

Both Ross Brogan and Tony Café raised some very interesting and not dissimilar points in the September 1998 issue of *Firepoint*. For some time I have been arguing for a uniform and enforceable code of ethics/conduct for fire investigators as a means of formally installing the scientific method into a legal/judicial context. The reality is, however, that this is a long way off.

The main point raised by Ross (that of opinion being proferred by someone who has never visited the fire scene) would be adequately dealt with if scientific method was more vigorously pursued as a standard by both prosecution and defence. The scientific method espoused by the NFPA (921:1998) states quite clearly that information related to the fire scene is collected by "direct data gathering means". Furthermore, Sarantakos (1993) in describing acceptable ethical standards in professional practice suggests that "researchers should not publish findings on data they did not collect".

Be that as it may, it is clear that the opposing sides in many legal disputes, revolving around fire, have had a tendency to play a game of opinion poker. One side opens the betting with an experienced fire investigator (with possibly little formal education), the other counters with a graduate scientist. The betting continues with PhDs and professors. Eventually either one side folds under the weight of post nominals or courts become so confused by the variety of opinion on offer that a 'fair' decision is difficult.

At each stage of this bidding war the opinion is more and more removed from the actual investigation of the fire itself. Again, if scientific method was to be employed as a counter (as opposed to a general endorsement of the process by joining in) then perhaps some consistency and integrity could be brought into the process. One must feel sorry for the poor jury who are caught in the middle of these competitions, with little expert knowledge of their own against which to test the combatant's arguments. Is it any wonder that many of the published discussions on witness etiquette highlight issues such as speech, dress etc. rather than concentration on providing a scientifically valid and cogent opinion.

Ross Brogan also highlights the practice of criticising the notes and or photographs of someone who has actually investigated the fire scene as a means of validating an alternate opinion. This sort of behaviour smacks of *Argumentum Ad Hominem* where the person rather than the message is attacked and has been dealt with in a recent local South Australian case (*Penney v Queen*). The Court of Criminal Appeal (when dealing with issues of what wasn't contained in notes and photographs) decided that, "it is a waste of time to speculate on what might have been - the jury had to consider what evidence was before it". The message here is that opinions need to be based on fact. If that 'fact' is not available (e.g. not in photographs etc.) then there is no license for imagination, speculation or fantasy to be introduced in its place.

Some time ago the South Australia Police, Fire Investigation Section introduced a 'Statement of General Principles' which include, amongst other issues, the quite clear understanding that opinions will not be given for any fire where there was either no scene attendance or where the attendance was unreasonably delayed. A copy of this 'Statement' is attached to every report, affidavit and declaration submitted by members of the Section. If anyone wishes to question your integrity (as opposed to ability) then we are providing the means by which they can do so. I wonder if some of Ross Brogan's past nemeses would contemplate doing the same?

My only contention with issues raised in Tony Café's article is his assertion that Scientific Method dictates that only qualified scientists can make comment or publish research. This is in fact at odds with Scientific Methodology which provides the guide for the conduct of valid scientific enquiry. The extremely important proviso, however, is that any comment, opinion, conclusion made is within the parameters of the person's training, ability and experience (NFPA 921:1998). A scientific paper prepared by a relative dunce is still valid providing that the author does not attempt to comment beyond the level of their ability.

It would appear that issues of integrity, ethics, principle and the like are beginning to cause heartache for many fire investigators. Perhaps it is time that these issues were addressed and an effort made to develop a code of practice. The NSW AFI has a significant role to play in this discussion and exploring possible remedies. Might I suggest that the next annual conference of the NSW AFI would be the ideal forum to begin such a debate - where fire investigators from around the country would have the opportunity to express their view.

Paul Bahr Ass.Dip. B SocSc
South Australia Police
Fire Investigation Section

PRESIDENTS REPORT

1998 is quickly drawing to a close and I wish to take this opportunity to thank the Committee for their tireless efforts over the past ten months and our members for their support.

Although we may not have achieved all that we set out to achieve during 1998, what has been achieved deserves mentioning.

The "Theme" Breakfast Meetings have been extremely informative and well received by those members who attended. Some of the topics addressed this year include Workplace Health & Safety at a Major Fire Loss, Gas Characteristics and A Burns Breakfast.

Whilst our Major Project was postponed this year, all has not been lost. Following on from the success of the Operation Bright Spark video, the committee is currently editing the film footage of the "mock" court proceedings during the 1997 Coronial Inquest one-day seminar. The first of these training video's will be available for release on VHS in early 1999.

I wish you a safe and merry Christmas and a happy and prosperous new year.

MEMBERSHIP

The Committee welcomes the following new members to the Queensland Chapter;

- **John Lear,** Qld Police Service, Toowoomba
- **Snr Sgt Brad Hall,** Qld Police Scientific Section, Brisbane
- **Sgt Lindon Smallwood**, Qld Police Scientific Section, Brisbane
- **Insp. Paul Stewart**, Qld Police Scientific Section, Brisbane
- **Crissty Norman**, Qld Police Service, Woodridge
- **Catherine Brown**, Qld Police Service, Woodridge
- **Lisa Bundesen**, Accountant, Vincents Chartered Accountants, Brisbane
- **Jonathan Dooley**, Partner – Forensic Accounting, Vincents Chartered Accountants, Brisbane
- **Paul Vincent,** Partner – Forensic Accounting, Vincents Chartered Accountants, Brisbane

Membership and costs of the Queensland Chapter are currently being reviewed. Membership renewal notices will be forwarded during December for payment in late January 1999.

SPONSORSHIP PROGRAM

The Queensland Chapter has recently introduced a sponsorship program for the Association. The program started in October and will continue through to December 1999.

I wish to sincerely thank the following organisations for their sponsorship support;

Major Sponsor
Dunhill Madden Butler
(Solicitors)

Supporter Sponsors
Aust Pacific – Claims Group
Forensic Services Australia
Mullins Emergency &
Restoration Services Pty Ltd
Peter Thomas & Associates

The funds from the sponsorship program will assist the Queensland Chapter with the costs associated with the production of our bi-monthly newsletter to members and the insurance industry, production costs for the Coronial Inquest video and any other major project undertaken throughout 1998/99.

Representatives from our sponsor organisations will also be guest speakers at our 1999 breakfast meetings.

1999 ACTIVITY PLAN

The Chapter Committee recently approved the following dates for our 1999 Activity Plan.

Breakfast Meetings
Tuesday 16 February 1999
Tuesday 20 April 1999
Tuesday 15 June 1999
Tuesday 17 August 1999
Tuesday 19 October 1999

Annual General Meeting
Wednesday 24 March 1999

Major Project
Thursday 28 & Friday 29 October 1999 (tentative)

Christmas Function
Friday 3 December 1999

"Overview of" THE BURNS BREAKFAST 18 August 1998

Our Association was treated to one of its most colourful breakfast meetings ever when our guest speaker, Doctor Michael Muller, spoke of his work in the Burns Unit of the Royal Brisbane Hospital.

His accompaniment was a selection of over 60 colour slides which were warmly

digested as the audience savoured the delicate flavours of the crisp bacon and eggs provided by our hosts, The Brisbane Club.
It is hoped that members of our Association may be able to utilise the expertise of the Doctor where certain forensic evidence may be able to be sourced from the burns suffered by either the victim or author of a fire.

Skin Bank

Doctor Muller also spoke of the establishment of the Queensland Skin Bank, a joint enterprise of the Royal Brisbane Hospital Burns Unit and the Red Cross Blood Transfusion Service.

Did you know that on average the Royal Brisbane Hospital Burns Unit receives 25 patients a year who have received burns to more than 50% of their body?

Strains are put on the resources of the Burns Unit when major catastrophes occur such as mines and oil field explosions, and bush fires.

The establishment of the Skin Bank has been a step forward to alleviate some of this strain. The most important development at the Skin Bank is the skin culture laboratory. Here, a sample of the patient's skin, as little as only a few square centimetres can be grown into a sheet of skin about a square metre in around 3 weeks. This permits the patient to have their own skin for grafting.

The establishment of the Skin Bank has been made possible through funds donated by the community, from organisations such as Zonta Clubs and District 24, a memorial gift from the Estate of Tom and Dorothy Cook, the Lions Clubs of Stafford and Grange and many others. Further funding is needed to maintain the operation of the Skin Bank and develop the skin culture laboratory.

For further information on the Skin Bank and your donations, contact David Rose (Royal Brisbane Hospital Research Foundation) on (07) 3253 8726, or Doctor Michael Muller on (07) 3253 8314. Their work is essential in our community.

by Murray Nystrom

PRODUCT RECALLS
(issued within the last 12 months)

In the interest of public safety, the Electrical Safety Office would like to bring attention to the following product recalls. Please note this is not a complete list of all recalls involving electrical appliances in Australia, but these recalls are highlighted due to particular safety issues.

The recall notices were released voluntarily by the responsible company in all major Australian newspapers and have been reproduced by the Electrical Safety Office. The recalls have been sumarised and the full notices are available from the Electrical Safety Office.

1. **"TEAC" Colour Television** - 48cm (20 inch) and 51cm (21 inch) colour television Models CT-484, CT-M484mkII, CT-M486, CT - M486mkII and CT-M511s. Call 1800 656 700.

2. **"TAAV" Steam Vaporizer Heating Units** - manufactured prior to November 1995. Call (02) 6286 3364.

3. **"Hotpoint" Fan Assisted Radiant Heater Model PS102** - purchased after 1 February 1998. Call 1800 352 551 or 1800 252 551.

4. **"Breville" BB200 Bakers Oven Breadmaker** with batch number of 744 or lower. Call 1800 702 002.

5. **"Arlec" Plug In Night Light product code NL800** batch numbers:- Date batch no: 0697m sikd after 02/04/97; Date batch no: 1497, sold after 23/08/97. Call 1300 368 779.

6. **"Maxim" Electric Carving Knife Model 9090** - purchased November 1997. (03) 9585 4660

7. **"Stefan" Hair Dryers Model PC-19** - sold from May 1997 - January 1998. Call 1800 773 333 or (07) 3844 9999.

8. **"Sanyo" Twin Tub Washing Machine Model SW-445AP Made in Korea** - sold between July 1995 and December 1997. Call 1300 360 230.

9. **"HPM" branded double adaptors with the markings Series 102** on the rear of the adaptor purchased prior to 1994. Call 1800 111 000. (Public Warning)

10. **"Whirlpool" Model AWM293 Front Load Washing Machine** sold since June 1997. Call 1800 880 222.

11. **"KTC Topscan" 15 Inch Computer Monitor Models CAE364SG, CAE356SG & CAE565SG** purchased during the period of July 1995 to December 1996.

Call Edge Computer (02) 9906 5550 or OBM (No.2) Computer Wholesales (02) 4956 8955.

Electrical Safety Office Contact Details

Recalls Ph: (07) 3237 0280
Fax: (07) 3237 0229

www.dme.qld.gov.au/safety/electric/index.

OVERSEAS NEWS

"Florida Wildfires"

US Insurers estimate the Insured damage from the Florida wildfires will far exceed the £15m which categories it as a catastrophe. Not only have over 350 homes been destroyed to date, but the US Insurance Information Institute has been inundated with additional claims for smoke damage to homes, crop damage and claims for business interruptions.

Information from the Post Magazine July 1998

"Arson in Schools"

A national campaign has been launched today in an effort to cut the £51m bill for arson in schools.

The Arson Prevention Bureau (APB) joined with Home Office Minister George Howarth to launch the scheme, which will see every education establishment in the country sent a booklet, sponsored by Zurich Municipal, designed to help schools assess their own vulnerability to an attack and how they can substantially reduce the arson risk.

Arson now accounts for 85% of all fires in schools and in 1997 it cost the Insurance Industry £51m.

In the last decade the combined costs of arson attacks on schools would have enabled education authorities to build and equip 43 new schools.

The campaign is the first in a series which will be launched by the APB following its takeover by the Association of British Insurers (ABI).

APB chief executive Tony Baker said "the current level of arson attacks on schools is unacceptable and must be reduced".

"Arson not only causes widespread and extensive damage but can severely disrupt pupils' education."

Information from the Post Magazine July 1998

"Teamwork can beat Arsonists"

At the recent 1998 Anglo-American Fire Investigation Conference 'Live, Learn and Pass It On', organised by Gardiner Associates, the UK organisation devoted to the training of fire brigades, there were various requests from fire brigade and police delegates for a far greater sharing of information between the emergency services and Insurers.

It was generally accepted that Insurers and the emergency services are on the same side in the fight to combat arson.

While Insurers' interests lie, in particular, with fraudulent arson of commercial property, the emergency services' problems with arson take in a far wider scope; not all arson fires are started for financial gain.

The human cost of this problem can be immeasurable, culminating in the depth of a person in a deliberately set fire. When those killed are children, it is an unanswerable demand that all possible steps must be taken to ensure that arson is stamped out.

The economic cost of fraudulent arson is enormous - £750m in 1996 alone is widely quoted. Over 100 people died and more than 3,000 were injured in arson fires in the same year.

How can this co-operation repeatedly called for and obviously needed, be promoted? National Insurance law firm Wansbroughs Willey Hargrave has set up, with the West Yorkshire Fire Brigade and police, a working arrangement for co-operation and the sharing of resources and information, wherever possible. Co-ordination of any investigation is vital from the outset.

Information from the Post Magazine September 1998

SURF THE NET

For those who like to surf the net, here are a few sites worth a look;

www.nasfm.com This is the home of the National Association of State Fire Marshalls and the best way to find out what is happening in the various US state fire headquarters, fire academies, libraries and updates on legislation.
www.smokeybear.com All you ever wanted to know about forest fire safety, plus a kids page.

FIRE (DETERMINATION OF CAUSE) A Review: 1995 to 1998

by Dr Chris LENNARD

Coordinator (Scientific), Forensic Services
Australian Federal Police, GPO Box 401
Canberra ACT 2601, Australia

INTRODUCTION

This report covers advances in scientific methods applied to fire cause determination over the past four years. Major forensic laboratories from around the world were asked to provide information on both published articles and internal research reports in this area. A literature review was also conducted covering articles published in the principal forensic journals over the period in question. This was supplemented by an extensive search of "Chemical Abstracts" for articles related to fire investigation in the forensic arena. The final report is a collation of information received from these various sources.

SCENE EXAMINATION & GENERAL FIRE INVESTIGATION

General

The steps involved in the forensic determination of "origin" and "cause" of fires, with an emphasis on the stages and dynamics of a fire, methods of investigation, and the types of evidence available after the fire, have been reviewed by Lilley (1).

Ide (2) has likened fire scene investigation to archaeology, where the location of seats of fire corresponds to the initial fieldwork carried out by archaeologists and, in both disciplines, an excavation stage is normally necessary. Debris originating from different sources may be expected to fall at different stages during the course of a fire. Significant information may be acquired from the diffuse stratification that results and from consideration of the positions of items recovered from the debris.

In the fire investigation process, it is generally agreed that one first determines the point of origin and then the cause. Often the point of origin is found with some accuracy, but the cause is unknown. However, a number of case examples has been given by Béland (3) to illustrate that, in some instances, the cause of a fire can be determined with a high degree of certainty, even though the point of origin is not known.

Schudel (4) has reviewed techniques for glass fracture analysis that can assist investigators at the fire scene. Different types of flat glass are described, with an explanation of how glass breaks as a result of impact or thermal stress.

The char surface of burnt wood has an appearance resembling saurian skin, hence the term "alligatoring" (or "crocodiling") which is commonly employed by fire investigators to describe this phenomenon. Alligatoring (particularly char depth and appearance) is sometimes employed as an investigative tool to aid in the determination of the cause of a fire. Some investigators hold the view that it can provide information such as fire duration, the type of combustion (slow or rapid), and the possible presence of a liquid accelerant. Schmidt and co-workers (5) conducted a series of controlled experiments to assess the validity of conclusions derived from wood charring. The results indicated that the wood type and the nature of any surface treatment are determining factors in the formation of a particular char pattern. The presence of a liquid accelerant, on the other hand, did not appear to have any significant effect on the appearance of the resulting char. It would therefore appear unjustified for the fire investigator to reach conclusions solely based on alligatoring as a form of evidence.

Since their introduction in 1945, aerosol spray containers have been used to disperse almost every conceivable consumer product from insect repellent, paints, lubricants, hair dressings, deodorants, air fresheners, and cooking oils. For many years, the propellants used in aerosol cans were low molecular weight chlorofluorocarbons (CFCs) that are not only effective, non-toxic, and inert, but also non-flammable. More recently, the use of CFCs has been severely restricted due to their suspected role in damaging the global ozone layer. Modern aerosol products make increasing use of highly flammable petroleum gases such as propane, butane, and isobutane. DeHaan and Howard (6) have reviewed the propellant composition of a range of consumer aerosol products and described two cases where the release of these propellants created an explosive mixture that deflagrated resulting in serious structural damage.

Arson for profit has become an ever-increasing problem for the fire investigator. Analysis of financial statements is critical in arson for profit investigations. To assist investigations of this type, Crewse (7) has reviewed techniques for forensic accounting. If records have been destroyed or "lost" in the fire, the investigator must be able to reconstruct a financial picture of the business through numerous means, including contacting creditors, suppliers, accountants, bookkeepers, current and former employees, and obtaining bank records, cancelled cheques and the like.

Bølviken and Egeland (8) presented a case study where statistical evidence played a major part in an arson investigation in Norway. A fireman was known to have been present at the scenes of fire, prior to their onset, in no less than 24 out of 37 cases of forest fire. A number of issues related to the interpretation of evidence were discussed.

A homicide investigation involving arson has been described by Tsaroom (9). Professional fieldwork, together with forensic laboratory examinations, led to the life imprisonment of a Moslem Israeli citizen for the murder of his pregnant 19-year-old daughter.

Tontarski (10) has described the role of the Bureau of Alcohol, Tobacco and Firearms (ATF) Fire Investigation Research and Education (FIRE) Centre. The FIRE Centre represents a partnership between law enforcement, fire services, public safety, industry, and academia. Its strategic goals include the following:

- conduct essential fire-related research that validates fire scene indicators and improves fire evidence analysis;
- support fire investigations and the resolution of fire-related crimes;
- develop better investigative and prosecutorial procedures using scientifically validated methods; and,
- provide a repository for fire investigative research data and disseminate the knowledge gathered.

Accelerant Detection Techniques at the Scene

Instrumental Techniques

A new technology based on gas sensor arrays has been investigated by Barshick and co-workers (11) for its applicability to forensic and law enforcement problems. The technology employs an array of sensors that respond to volatile chemical components, yielding a characteristic "fingerprint" pattern representative of the vapour-phase composition of a sample. Sample aromas can be analysed and identified using artificial neural networks that are trained on known aroma patterns. The detection mechanism mimics the main aspects of the canine olfactory system: sensing, signal processing, and recognition. Possible applications include the analysis of aromas emanating from cadavers, illicit drug detection, and the analysis of fire debris for accelerant identification. A preliminary study has confirmed the feasibility of aroma detection technology for detecting ignitable liquid accelerants in fire debris (12). However, further research is required to understand the relationship between the accelerant, the substrate material, the effects of the fire, the method used to extinguish the fire, and the effects these may have on sampling and sensor response.

A portable photoionisation analyser (sniffer) and a portable gas chromatograph (GC) were tested by Klinteberg and Wistedt (13) as field-portable instruments for the analysis of accelerant residues in fire debris. Tests were performed at actual fire scenes and also with fire debris from controlled fires where known accelerants had been used to start the fire. Results indicated that the sniffer may have use at the scene for the selection of fire debris samples for submission to the laboratory. However, the portable GC was found to be impractical, lacked sensitivity, and was not cost-effective.

Accelerant Detection Canines

An Accelerant Detection Canine (ADC) may be defined as a canine trained to locate traces of an ignitable liquid at a fire scene. In the United States, in particular, the use of ADCs to enhance the investigation of fire scenes is becoming increasingly popular (14, 15). The usefulness of ADCs is directly related to their ability to detect minute quantities of potential accelerants in complex sample matrices. The ability of an ADC to pinpoint the likely location of residual ignitable fluids at a fire scene can significantly reduce the number of fire debris samples collected by the investigator, thereby reducing the laboratory workload. In addition, the quality of the samples is increased in that more 'positive' samples are likely to be collected.

Studies have been conducted by Kurz and co-workers (16) to determine the lower limits at which canines can reliably detect products commonly used as fire accelerants and distinguish them from pyrolysis products or background hydrocarbons. As part of the study, 34 trained canines were subject to a series of controlled tests. As a group, the canines were remarkably accurate in alerting on 50% evaporated petrol at the 5 μL level. They were less accurate at finding trace quantities (0.05 to 0.2 μL) of petrol on samples containing significant pyrolysis products, and a number of alerts were registered on samples containing only burnt carpeting material. The canines were also less successful at finding volatile petroleum products other than petrol. The significant number of alerts by canines on samples not containing accelerant residues confirmed the importance of obtaining laboratory confirmation, and on keeping accurate field and training records for each canine to establish their credibility.

Tranthim-Fryer and DeHaan (17) reported on the identification of carpet and underlay pyrolysis products to which accelerant detection canines had responded falsely positive during validation and certification testing. The samples of burnt carpet and underlay were examined for pyrolysis product profiles using passive headspace concentration/solvent elution and analysis by gas chromatography. The study demonstrated that canines can respond to pyrolysis products from polymers such as nylon 6/6, styrene-butadiene, ethylene-vinylacetate-indene, polypropylene, styrene-butadiene-isoprene, and poly(1-butene)-polyethylene, sourced from carpet pile fibres, adhesives, plastic mesh backing material, rubber underlays, and rubber backing materials.

Canines trained to alert to traces of flammable liquids at a fire scene are unquestionably useful to help identify locations to collect samples for laboratory analysis. However, in some instances, no samples are collected or laboratory testing of samples collected following a canine scent alert fails to identify a potential accelerant. An attempt may be made, though testimony of the dog's handler, to introduce information at trial regarding the canine alert to indicate the presence of an ignitable liquid at the scene. While dog handlers contend that the canine's nose is more sensitive than the instruments used in the laboratory, they tend to ignore the inherent conflict between sensitivity and selectivity. Unverified canine indications have been used in a number of cases in the USA, reviewed by Katz and Midkiff (18). The authors concluded that, unless confirmed by laboratory analysis, canine alerts alone cannot be considered sufficiently reliable for introduction as evidence in court.

Thermodynamics

Urbas (19) has reviewed the most commonly used fire test methods, required to obtain thermodynamic data for fire models and thus to allow computation of fire parameters that describe fires in buildings. The two technologies that are used individually or as part of standard test methods are oxygen consumption for heat release rate (HRR) measurements and small, water-cooled heat flux meters for heat flux measurements. Large calorimeters are the most important testing tool available at this time to quantify fires for fire litigation purposes.

The quantitative expression of fire "size" is the heat release rate (HRR) of a fire. To determine the HRR of a fire, it may be sufficient to examine tabulations of values for various objects that have been studied in the past. It may, however, be important to conduct specific measurements of HRR for objects related to the fire in question. The use of calorimeters to measure HRR, and the use of HRR data in fire modelling, has been reviewed by Babrauskas (20).

Experimental work assists in understanding fire behaviour in structural fires. Temperature measurements at different locations during a house fire provide necessary data for the development of mathematical models that attempt to simulate the fire on a computer. Lilley (21) has described temperature measurement tests conducted on a small single-level house that was the subject of a complete experimental burn.

The available literature on experimental measurements of smouldering to flaming transition in upholstered furniture has been reviewed by Babrauskas and Krasny (22). Out of a total of 102 items of upholstered furniture subjected to smouldering ignition in laboratory tests, 32% burned up partially or completely without erupting in flaming, 64% did go to flaming, while the remainder were manually extinguished or were indeterminate. The mean time for smouldering-to-flaming transition was 88 min (minimum 22 min; maximum 306 min). The existing data did not permit firm conclusions regarding the fabric and padding materials that are most prone to transit to flaming.

A study was conducted by Tristan Rochaix (23) to investigate the behaviour of polyurethane foams when heated below their inflammation temperature. A range of polyurethane foams was analysed by Differential Scanning Calorimetry (DSC). Kinetics calculations were used to predict the heating times necessary to reach combustion at various temperatures (assuming minimal heat dissipation). Values obtained from the analyses were verified by heating larger foam samples in a laboratory oven at different temperatures and over a range of time periods.

The cause of a fire has often been attributed to lighted cigarettes when, in fact, the combustion materials available in many cases cannot be set on fire by such an ignition source. Experiments with flammable gases and vapours have shown that a lighted cigarette did not ignite many of the most commonly encountered substances, including methane and petrol vapour. A review by Holleyhead (24) discusses the physical and chemical parameters that govern the ignition of flammable gases and vapours. Temperature and gas concentration measurements inside a burning cigarette have been reviewed and data from such studies have been used in conjunction with combustion parameters to explain the experimental findings.

During the winter months, many structural fires are attributed, for one reason or another, to heating equipment. While it is probable that the majority of these determinations are correct, this conclusion may sometimes be reached simply because it is the only explanation remaining. It is important that the fire investigator is familiar with the basic design and operating characteristics of common gas and oil fired/forced warm air furnaces. Bertoni (25) has presented a brief overview of the fuels, fuel delivery methods, and the operating characteristics of these systems.

Electrical Fires

General

The professional forensic electrical engineer is frequently called upon to provide expertise in fire investigation when the generalist in fire cause and origin cannot offer a scientifically acceptable electrical explanation for the fire or when an electrical cause is suspected or unproven. By employing the principles of physics and electrical engineering, the engineer-investigator can arrive at plausible scientific explanations for many fires. This expertise is important in assisting the legal system to adjudicate the liability for a fire. Nabours and Fellow (26) have set forth many of the fundamental principles used for the scientific investigation of alleged electrical fires and illustrated these principles through actual fire case studies.

The problem with the investigation of building fires is usually not of finding "a cause" (there are normally numerous possibilities) but of finding "the cause" to the exclusion of all others. Pointing to electricity as the cause is usually quite easy, and often wrong, since electrical wires and devices are almost everywhere in any building and will obviously be damaged by the fire. Béland (27) has considered a number of cases in which electricity was identified as the cause, despite the fact that supporting evidence was very weak or nonexistent. In these cases, legal action was taken against the manufacturer, the electrician, or other persons who had something to do with the electrical installation. The cases illustrate how easy it is to err in determining a cause for a fire, particularly when electricity is one of the possibilities.

The fire investigator sometimes has to rely on electrical measurements. While there are many circumstances under which these measurements present no problem, there are others that present serious pitfalls. Several examples of actual field cases have been presented by Béland (28) in which improper methods of measurement led to wrong conclusions.

Béland (29) has reported on a study of the heating of conductors under overload and short-circuit conditions. It was shown that, in both cases, the smaller of the two conductors in series is subjected to considerably more heating than the larger one. In most cases, if not all, the smaller conductor will be completely destroyed before the larger one is subjected to any significant heating.

After a building fire, all kinds of broken copper wires can be found in the debris. At the point of severance, the ends could show numerous forms such as plastic deformation, fragile fracture, pointed ends, beads, and numerous other characteristics. The break could be due to the heat of the fire, a very high current, or a combination of these, as well as mechanical fractures, either at fire temperature or nearer to room temperature, with or without current. Béland (30) has reviewed the characteristics that result from the mechanical breakage of copper conductors under different conditions.

Rakosnik (31) has reported on a fire that resulted from a poor "back-wired" connection in an electrical outlet that was used to supply continuous power to a high-amp space heater. Lowe and co-workers (32) reported on the dangers associated with halogen lamps. Tests have revealed that the heat generated by a 300 watt halogen bulb in a floor lamp is comparable to that of an open flame, and well above the ignition temperature of ordinary combustibles. These high temperatures, well above those of ordinary 300 watt incandescent bulb, are the cause of many residential fires.

After a lightning discharge on a building, the investigator can be confronted with two extremes: (i) the lightning discharge has left obvious and easily interpretable marks of its path through the building, from the point of impact to where the current earthed; or, (ii) if a fire is produced by the lightning discharge, it can be very difficult to discover clear marks indicating the current's flow. Martin (33) has reviewed the nature and interpretation of characteristic marks left by a lightning discharge.

Electrical Arc Residues

The presence of electrical arcing in the area determined to be the origin of the fire can suggest to the investigator that an electrical malfunction caused the fire. However, fire can also cause arcing by destroying the insulation. So the question arises as to which came first, the arcing or the fire. The chemical composition of arc beads, determined by Auger Electron Spectroscopy (AES), has been cited by Anderson and co-workers (34, 35) as a method to determine whether the arcing was the cause or result of a fire. The hypothesis is based on the idea that atmospheric gases are preferentially trapped in the liquid metal during the formation of an arc bead so that the gas concentrations in the bead are indicative of the atmospheric conditions at the moment of arcing. In theory, the presence of combustion products (eg. carbon) indicates that the arcing may have been the result of the fire. The absence of combustion products indicates that the arcing may have been the cause of the fire.

A review of the literature on the solubility of gases in liquid copper, as reported by Howitt (36–38), has indicated that there is no scientific justification for the above hypothesis. Howitt has also stated that the elemental variations that are found within a single arc bead readily account for the different measurements that have been erroneously claimed to be significant between arc beads formed under entirely different circumstances (38). Ettling (39) has also concluded that the chemistry and physics involved in the formation and total history of an arc bead cast doubt that the method proposed by Anderson can ever be valid. Henderson and co-workers (40) concluded that the carbon-content technique was of no value in distinguishing between "cause" and "result" beads. Not only were the elemental profiles inconsistent with the theoretical basis given by Anderson (35), but also Auger analysis of beads of known origin (standards) showed that the carbon composition of "cause" and "result" beads were indistinguishable.

Vehicle Fires

The task of investigating vehicle fires has become extremely complex due to the rapid explosion of technology found in the modern vehicle. To assist fire investigators, Bertoni (41) has presented an overview of the basic systems found in today's vehicles.

Suefert (42, 43) has produced a manual containing various theories on the origins of accidental automobile engine fires. These theories are supported by 31 case examples of actual automobile engine fires.

Sutherland and Byers (44) have described two automobile test burns that were designed to assess sampling techniques in order to improve the detection of accelerants in vehicle fires. Both pre- and post-fire samples were taken from a number of locations in each vehicle. Hydrocarbon accelerants were used in both cases, with samples being subsequently analysed by GC/MS and GC/MS/MS.

Du Pasquier (45) considered two electrical phenomena as ignition sources for vehicle fires: (i) electrical overload; and, (ii) electrical spark. A theoretical approach was illustrated by case studies as well as experiments conducted on a vehicle. The data allowed the determination of the conditions necessary for ignition to occur as a result of one of these phenomena.

The catalytic converter is designed to convert any unburned or partially burned fuel in vehicle exhaust into carbon dioxide and water. This is a combustion process that is aided by the catalyst in the converter and, as such, releases heat as a by-product. The converter is designed to work at 300–800° C, has a high calorific capacity, and is therefore an important heat source. Stauffer and Du Pasquier (46) have studied the conditions under which a catalytic converter can become an ignition source for a vehicle fire. A number of technical malfunctions have been analysed, indicating that it is possible to bring a converter to its melting point (approximately 1400° C). Practical cases were used to illustrate the findings.

Spontaneous Combustion

Spontaneous combustion can be defined as the onset of burning when there is no external or "pilot" source of ignition. Some solid fuels, under appropriate conditions, can progress from self-heating to smouldering ignition, followed in some cases by open flaming combustion after some time delay. Because the self-heating process is often so slow as to be not readily observable, fire investigators are sometimes tempted to regard spontaneous ignition as a myth that cannot happen. In addition to considerable case documentation, there is laboratory verification of the processes and observed tests of spontaneous ignition. DeHaan (47) has reviewed the processes of self-heating and spontaneous ignition, and described the thermodynamics of what is happening, giving examples of the processes involved. In a second study, DeHaan (48) has discussed the investigation and documentation of such cases. Stewart (49) has described the conditions necessary for spontaneous heating to occur, and gives advice regarding the investigation of possible spontaneous ignition fires.

Solid carbonaceous material, commonly described as "pyrophoric" carbon, can be formed when wood is exposed to relatively low temperatures (120–150° C) for very long periods of time, typically weeks, months, or even years (48). Spontaneous combustion of the pyrophoric carbon can result, at temperatures well below the ignition temperature of wood (200–300° C). This phenomenon has been used to explain numerous fires caused by steam pipes in close contact with combustible material. However, Schwartz (50) has warned that scientific research specific to pyrophoric carbon is almost nonexistent. Investigators are advised to use caution when assigning fire cause to pyrophoric carbon, particularly when other explanations cannot be ruled out.

Stories continue to resurface of humans becoming so hot that they spontaneously ignite. This has lead to the concept of "spontaneous human combustion" (SHC), considered by some professional fire investigators as a possible, plausible fire cause. DeHaan (51) has demonstrated, via a case example, that a body can be ignited by a modest external source and burn naturally over a long period of time in the absence of other significant fire damage, circumstances that have sometimes, erroneously, been attributed to SHC. The case illustrated the major features associated with supposed SHC incidents: substantial combustion of the human torso, leaving the head, arms, and legs largely intact, with no apparent source of ignition.

Body tissue, muscle and fat, whether animal or human, may occasionally constitute a significant percentage of the fuel load of a fire, and investigators may be faced with a scene involving significant destruction of an animal carcass or human body where the surrounding fuel bears little fire damage. Thus, as indicated above, the mythology of "spontaneous human combustion" (SHC) has arisen. In order to gain a better understanding of the phenomena involved, DeHaan and co-workers (52) have explored the combustion of animal (pork) tissue, predominantly subcutaneous fat, under a variety of conditions that may be encountered at a fire scene.

Information Technology

Computer Modelling

Fire investigation has, as have other disciplines, been greatly influenced by the proliferation of low-cost, powerful desktop personal computers. The ability of such computers to accurately and rapidly manipulate large quantities of complex data make them excellent tools for resolving problems related to fire behaviour. Ellington (53) has given a general overview of computer fire modelling and its potential value to fire investigations.

An increasingly wide range of computer-based fire modelling techniques has become commercially available. To illustrate the potential benefits from such technology, McDowell and Burton (54) have presented a case where temperatures and smoke layer heights predicted by a computer model were compared with the actual conditions generated during a full-scale burn of a structure. The results indicated that computer modelling can produce reasonably accurate results provided that precise input data is available and that the limitations of the model are fully comprehended. The authors concluded that computer modelling has a definite role to play in fire scene investigation provided it is used in conjunction with other forms of analysis.

Computer simulations, based on mathematical models for fluid dynamics, can help the investigator understand the complex physics underlying fire behaviour. Delémont (55) has conducted a study to determine if the zone or field models encountered in the area of fire protection and prevention can be used as forensic tools to assist the fire investigator in choosing between alternative hypotheses. Such models had already been used in a number of cases, but no systematic study of the possibilities or limitations of such computerised models in terms of accurately representing the development of a fire had previously been conducted.

The Internet

The last five years has seen an exponential increase in the worldwide use of the Internet, also referred to as the "Information Super Highway". As for other disciplines, the Internet has great potential for assisting the fire investigator with his duties. Electronic mail (e-mail) has become the communication tool of choice for contacting interstate and international colleagues. The World Wide Web (WWW) has provided a user-friendly, graphical interface that makes enormous quantities of information readily available to anyone connected to the 'net. Powerful search engines can be used to readily locate information on any subject imaginable. The proliferation of Internet Service Providers (ISPs) and powerful, inexpensive desktop computers has made Internet access readily available to a large percentage of the World's population. MacAloney (56) has summarised the potential of the Internet as a tool for the fire investigator. A list of Internet web sites of interest to the fire investigator has also been published (57). The International Association of Arson Investigators (IAAI) has a web site that contains links to a large number of sites of potential interest to anyone working in the field of fire cause determination.

Other Computer Applications

Effective information management is a vital component of all successful fire investigations. The increasing availability of powerful laptop computers, digital cameras, and mobile phone/modem technology offers a number of potential applications for the fire investigator (58). Information can be sent or received from remote locations to a central office computer. Databases can be accessed as required so that current fire investigation information is provided to the investigator at the fire site. A digital camera can be used to photograph the scene, with images immediately available for display on the laptop computer. Selected photos can be sent to the office via modem, to be reviewed by another investigator if required. This technology is already available using off-the-shelf equipment, with costs continuing to fall as performance increases.

Papilloud (59) has developed a systematic classification of fires based on likely cause, especially with respect to sources of ignition. The resulting computer database has been used to compare fire statistics between different regions and to indicate the quality of investigative procedures. By establishing links between fire causes occurring in a given region, it has been possible to: (i) identify series of arsons where similar modus operandi have been used; and, (ii) encourage a policy of prevention for recurrent technical causes (eg. faulty chimney construction, refrigerator defects, etc.).

The Bureau of Alcohol, Tobacco and Firearms (ATF) has formed a partnership with the American Re-Insurance Company, the US Fire Administration, and the National Fire Protection Association (NFPA) to produce a state-of-the-art CD-ROM/virtual reality arson investigation training program (60). The program aims to provide consistent arson investigation practices and procedures to insurance, fire and criminal investigators in the USA. Using photo-realistic virtual reality software, the training program puts the fire investigator inside a fire-damaged building right from a computer desktop. From that simulated vantage point, the investigator will immediately start making decisions and taking actions that would be required in an actual fire investigation. The investigator will be able to inspect the interior of a fire-ravaged structure from a 360-degree perspective, go down hallways, enter rooms, and zoom in to photograph and collect potential evidence. The program will even allow investigators to interview virtual witnesses, and to build a case file that ultimately will be evaluated by the program's virtual prosecutor.

LABORATORY ANALYSIS OF FIRE DEBRIS SAMPLES

General

Lee and Hubball (61) have reviewed the field of fire debris analysis from sampling and sample pre-treatment through to chromatographic analysis and data interpretation. The role of the forensic chemist in the determination of fire cause has also been outlined by Bertsch (62).

Since 1989, the American Society for Testing and Materials (ASTM) Committee E 20 on Forensic Sciences has continued to formulate voluntary consensus standards for the forensic sciences (63). The impetus for standardisation of laboratory procedures comes from several directions. Laboratories seeking accreditation can refer to Standard Test Methods for their written procedures, rather than "re-inventing the wheel". Bodies that administer examinations for the certification of individuals can have a body of knowledge from which to draw their examination material. And, competent individuals performing valid tests will have an authoritative source to lend credibility to their conclusions, and to question the credibility of improper or invalid methodology.

The first group of standards promulgated by the ASTM Criminalistics Subcommittee dealt with fire debris analysis. These standards were adapted from the *Guidelines for*

Laboratories Performing Chemical and Instrumental Analyses of Fire Debris Samples, developed by the International Association of Arson Investigators (IAAI) Forensic Science Committee in 1988. The current list of ASTM standards pertaining to the laboratory analysis of fire debris samples is given in the table below (64).

CONCLUSIONS

A review of the relevant forensic literature published over the last three years (1995 to August 1998), covering areas related to fire cause determination, has highlighted the following:

- The development of improved portable sensors and the increasing popularity of accelerant detection canines (particularly in the USA) have provided considerable assistance to scene examiners when selecting fire debris samples suspected of containing ignitable liquid residues. However, several studies have highlighted the requirement for obtaining independent laboratory confirmation of results obtained at the fire scene by these means.
- A better understanding and application of thermodynamic principles have assisted fire examiners in their study of complex fire phenomena. A measurement of appropriate thermodynamic parameters has provided the data necessary for fire modelling applications.
- The study of electrical causes continues to be an area of research activity, with several reports being published that may provide assistance to fire examiners.
- The elemental profiling of electrical arc residues continues to be an area of controversy, with the general consensus being that such analyses are of no value in distinguishing between "cause" and "result" beads.
- A number of studies have been conducted in order to gain a better understanding of vehicle fires. Several review articles have been written to assist investigators in this regard.
- Conditions necessary for spontaneous combustion to occur have been examined by a number of authors. Myths concerning spontaneous human combustion (SHC) have been dispelled.
- The exponential growth of the Internet has provided the fire investigator with a powerful communication tool and ready access to an enormous quantity of worldwide information.
- The proliferation of powerful but inexpensive desktop and laptop computers has lead to an increasing number of fire modelling and database applications that can assist the fire investigator. In addition, future training packages for fire investigators are likely to be based on CD-ROM/virtual reality software.
- As more forensic laboratories move towards accreditation of their services, there will be an increasing reliance on standards test methods such as those covering fire debris analysis. Organisations such as the American Society for Testing and Materials (ASTM) have taken a leading role in the development of such standards.
- Passive headspace sampling techniques for fire debris analysis continue to be refined, with the use of commercially produced activated charcoal membranes (charcoal strips) now being widespread.
- Solid-phase microextraction (SPME) techniques show considerable potential and may eventually replace charcoal strips as the sampling method of choice. SPME is a rapid, effective, solvent-less technique that offers many advantages over conventional processes. Thermal desorption eliminates the need for toxic or flammable solvents (eg. CS_2).
- The bench-top GC/MS system has now

become a standard piece of equipment for the analysis of fire debris extracts. Selected ion monitoring and extracted ion profiling techniques can greatly assist the forensic chemist with the interpretation of chromatographic profiles from complex samples.

- Expert GC/MS systems have been developed that automate data evaluation to some extent, but pattern recognition by visual means is still the final step in the analytical process. The use of artificial intelligence-based software for automatic pattern recognition awaits future implementation.
- GC/MS/MS has been demonstrated to be a powerful technique that can confirm the presence of ultra-trace levels of accelerant in complex fire debris extracts where normal chromatographic procedures would fail. It can be anticipated that there will be an increasing use of this form of technology in the future.

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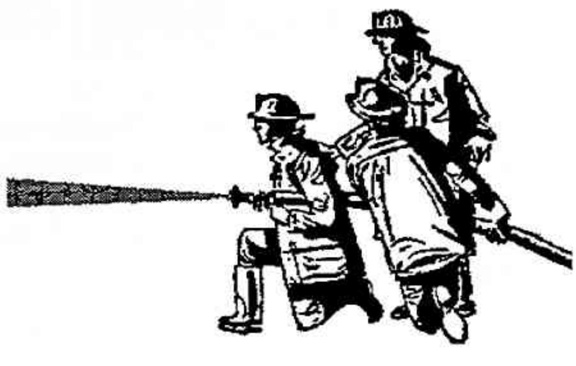
E 1387 – 95	Flammable or Combustible Liquid Residues in Extracts from Samples of Fire Debris by Gas Chromatography
Reference:	*Standard Practices for:*
E 1389 – 95	Cleanup of Fire Debris Sample Extracts by Acid Stripping
E 1388 – 95	Sampling of Headspace Vapors from Fire Debris Samples
E 1385 – 95	Separation and Concentration of Flammable or Combustible Liquid Residues from Fire Debris Samples by Steam Distillation
E 1386 – 95	Separation and Concentration of Flammable or Combustible Liquid Residues from Fire Debris Samples by Solvent Extraction
E 1412 – 95	Separation and Concentration of Flammable or Combustible Liquid Residues from Fire Debris Samples by Passive Headspace Concentration
E 1413 – 95	Separation and Concentration of Flammable or Combustible Liquid Residues from Fire Debris Samples by Dynamic Headspace Concentration
Reference:	*Standard Guide for:*
E 1618 – 97	Ignitable Liquid Residues in Extracts from Fire Debris Samples by Gas Chromatography Mass Spectrometry

The paper published above by Dr. Lennard is part of a presentation he prepared for the 12th Interpol Forensic Science Symposium, held in Lyon, France on 20-23 October, 1998. The second section of his paper provides details of changes in laboratory analysis of fire debris samples. If you would like a copy of this second section contact the "Firepoint" Editor by email on Wal.Stern@uts.edu.au and supply your email address. A copy of the presentation will then be forwarded to you by email.



VICTORIAN NEWS

MESSAGE FROM THE PRESIDENT AND THE COMMITTEE

Being the last "Firepoint" for the year, the President and the Committee wish all the membership of the Victorian Chapter, a Merry Christmas and a Happy New Year. This last year has seen the Chapter strengthen and maintain its membership. In the last six months with the change in committee and ideas, we have moved toward smaller presentations and have provided to the membership six presentations which have all been well attended.

This has also created interest for our membership and the after presentation drinks have been a good chance to chat with each other and renew acquaintances. The Chapter needs the support of its members and by attending these presentations make it all work.

PRESENTATION AT FRANKSTON - CFA

On Thursday 27th August 1998 there was an open presentation attended by 120 on the Roles and Responsibilities of agencies in Fire/Arson Investigations.

Thanks to Frank Stockton noting the MFESB FIA specialising investigators in electrical, LPG/Gas, Automotive and Post Analysis Reports, Nicole Harvey the newly appointed Fire Investigation Co-ordinator for the CFA on her and CFA investigators roles. Colin Cortous from the Arson Squad Victoria Police spoke on Emergency Management Act, police agencies and cooperative investigations, Terry McCabe on Insurance perspective and finally John Kelleher from Victorian Forensic Science Centre with his bob cat shovel and his kangaroo.

Thanks to the Frankston Fire Brigade and to all the presenters who made it an interesting and informative night for all who attended.

INVESTIGATION OF GAS FIRES/ INVESTIGATION OF EXPLOSIONS

On Friday 11 September in the afternoon Alex Conway of the FIA MFESB presented a session to 45 on the properties of gases and the resultant problems and investigation of these type of incidents. From 1994 to date there have been recorded 54 BLEVEs and many more incidents involving both natural and LPG. This has been on the increase due to the increase in LPG powered vehicles, both truck and cars.

On Friday 18 September saw John Kelleher from the Victorian Forensic Science Centre present a session on explosives, explosions and the investigation of explosions.

After a small problem with the video, John's kangaroo reappeared on the scene. Using the videos John was able to highlight the areas of importance in explosions investigations and hopefully we have learnt by the experience of others.

Our thanks to both Alex and John on their excellent presentations and thanks to MFESB for the use of there facilities at the training college. These presentations were held from 2.00pm to 4.00pm to allow members to attend and then continue on for the weekend.

THE INVESTIGATION OF THE KEW COTTAGES FIRE

On Thursday 29 October Inspector Garry Martin of the MFESB gave to an audience of 65 a graphic and explicit account of the investigation and the following tests and reports on the fire at Kew Cottages. As Gary explained this is the first time that such extensive tests were undertaken and was the largest investigation in Australia.

Videos and still shots showed the scene, reconstruction and fire tests undertaken. Further information was published in "Firepoint" June 1998 issue. The committee wishes to thank Gary for the presentation and MFESB for the use of their facilities.

NOTE : Where possible the Committee is videoing all presentations to enable those members who were unable to attend to borrow. Any one interested contact Alex Conway at the FIA MFESB on 9420 3883.

MEMBERSHIP

The Victorian Chapter Committee and members wish to welcome the following new members :

Nicole Harvey
Peter Dedman
David Selleck
Alexander Wade
Ian Worrell
Narelle Johnson
Darren Black
Scott Coxhell
Stephen Klinger
Peter Lewis
Duncan Maughan

Membership of the Chapter is now in the range of 150 members with still more prospective members applying following the successful presentations. Members certificates have been printed and will be posted. Following finalisation of the membership list, it will be published and forwarded to all members.

CERTIFIED FIRE INVESTIGATOR PROGRAM.

Whilst attending the IAAI Conference in Portland this year I was approached by Mr. Hal Lyson regarding the implementation of the CERTIFIED FIRE INVESTIGATORS program.

This program has the following objectives;

* Recognition of professional standards of achievement in fire investigation theory and practice by Government and private sector fire investigators.
* Encouragement of continued education and training in the field of fire investigation.
* Increased professional standing in the fire investigation field.

A test has been developed covering the entire range of activities in the discipline of fire investigation.

The CFI program is administered by the IAAI in conjunction with participating chapter CFI committees.

For the examination to have relevance in Australia we need to review the documents and entry criteria to ensure the qualification standards are applicable for us. To this end I have been asked to review all the material relating to the program and respond to the CFI committee in time for the matter to be discussed at the next IAAI AGM in May 1999.

The New Zealand Chapter have already submitted their proposals and recommended changes and appear set to adopt the program once the
International Board accept the amendments.

There is no compulsion for an investigator to hold the CFI qualification nor does it give the holder any greater rights in court to present evidence.
It is an additional qualification that may assist the investigator in his/her activities. Not every fire investigator in the USA holds the certificate.

A copy of the requirements for the qualification have been forwarded to each State chapter President for comment. Should anyone need more information they can contact me on (02) 9895 4605 or e-mail, roger.bucholtz@nswfire.nsw.gov.au

I will need all responses to me by the end of February 1999 so that the matter can be progressed in time for the May annual general meeting in America.

INTERNATIONAL ASSOCIATION OF ARSON INVESTIGATORS

MEMBERSHIP APPLICATION

TO THE SECRETARY. ______________________________ CHAPTER ____________

ADDRESS ____

______________________________ STATE ______ POST CODE ______

(Refer to the list of State office bearers on page 3 for the appropriate address).

I hereby apply for membership of the ______________ Chapter of the International Association of Arson Investigators Inc. in accordance with its constitution and By-laws and agree to be bound thereby. I attach the sum of A$ _______ in payment of Annual Dues ($_______) and Initiation Fee ($_______).

All information recorded in this application is hereby warranted to be true and correct.

1. NAME IN FULL ______________________________ 2. DATE OF BIRTH __________
3. EMPLOYER ______________________________ 4. POSITION ______________
5. BUSINESS ADDRESS ____

   CITY/SUBURB ______________________ STATE _______ POST CODE _______
6. HOME ADDRESS ____

   CITY/SUBURB ______________________ STATE _______ POST CODE _______
7. PHONE (BUS) (   ) __________________ FAX (   ) ______________________

   MOBILE (   ) ______________________ HOME (   ) ____________________
8. PLEASE LIST ANY FORMAL QUALIFICATIONS (DEGREES. DIPLOMAS. CERTIFICATES etc. WITH THE NAME OF THE ISSUING AUTHORITY AND THE YEAR OF QUALIFICATION.

   ____

   ____

   ____
9. MEMBERSHIP of OTHER ORGANISATIONS______________________________

   ____

   ____
10. HAVE YOU EVER BEEN CONVICTED of a CRIME? YES _______ NO _______
11. FULL CONVICTION DETAILS ______________________________________

    ____
12. ARE YOU A MEMBER OF THE INTERNATIONAL ASSOCIATION of the IAAI?

    ___________ MEMBERSHIP No. ______________________________
13. REFERENCES *(Name. address. phone number. occupation)*

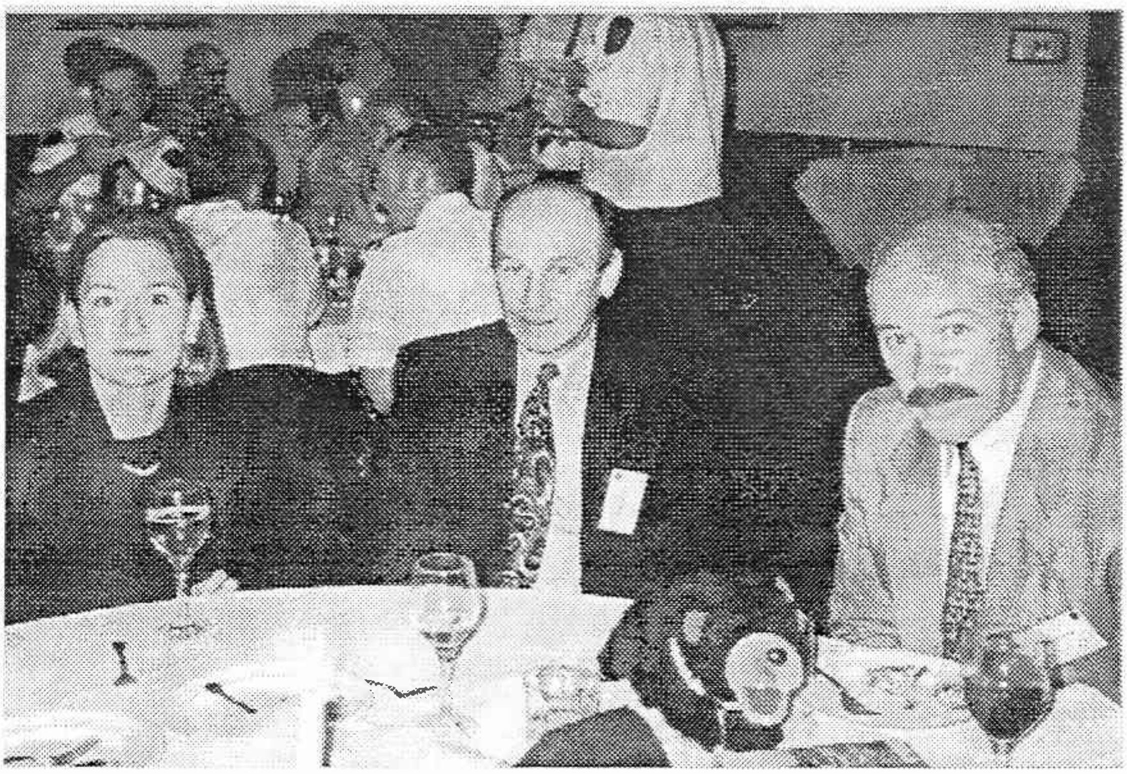
    A ____

    ____

    B ____

    ____
14. RECOMMENDED by a MEMBER in GOOD STANDING

    SIGNATURE ______________________________ DATE ______________
15. APPLICANT'S SIGNATURE ______________________ DATE ______________



Above: NSW AFI President Mitch Parrish presents a cheque for $5000 to Dr. Hugh Martin, for the Burns Unit at the Childrens Hospital

Below: Visiting speaker Robert Corry, with Nicole Maude and Roger Bucholtz, at the 1998 NSW AFI AGM dinner.