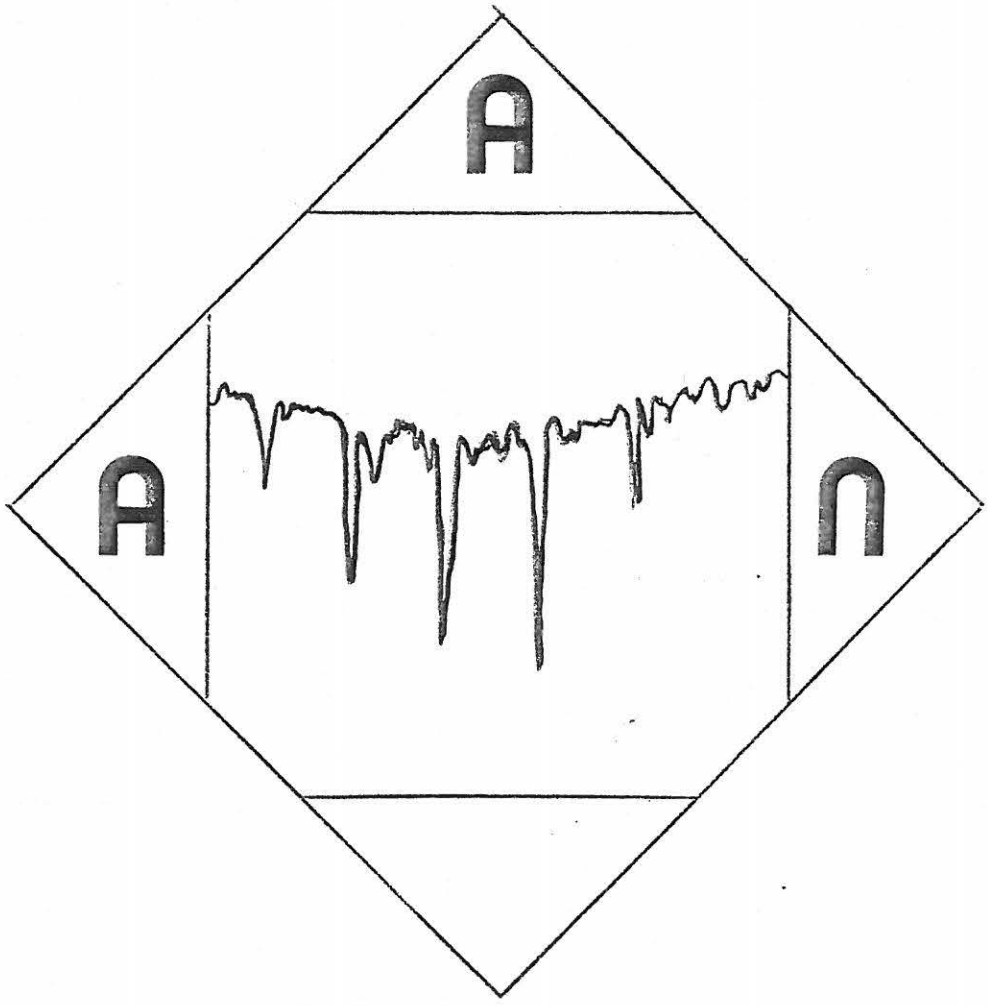
ARSON ANALYSIS NEWSLETTER

No. 2 OCTOBER 1976



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COMMONWEALTH OF PENNSYLVANIA
PENNSYLVANIA STATE POLICE
CRIME LABORATORY
P. O. Box 38
Greensburg, Penna. 15601

September 1, 1976

The Southwest Regional Pennsylvania State Police Crime Laboratory in Greensburg accepts arson evidence from any law enforcement agency within an eleven county jurisdiction. Due to the extensive service area, routine scene coverage is not possible. Therefore, practically all evidence is collected and submitted by the investigating officers or area fire marshalls usually within a day or two after the incident.

The analysis of material from a suspected arson predominantly involves the identification of liquid accelerants such as gasoline, kerosine, fuel oil, paint thinners, and other solvent based substances. Rarely are solid accelerants such as permanganate mixtures encountered in arson investigations.

Gas Chromatography and Infrared Spectroscopy are the primary instrument techniques used in analysis. If the amount of accelerant is sufficient both Infrared Spectroscopy and Gas Chromatography scans are made. However, in situations where minute quantities are present or a separation is not practical, vapor samples are analyzed by Gas Chromatography. The highly volatile portion is separated using a carbowax column and the high boilers are separated using either a Supelco SP2100 or OV-101 column. Since gas contains over 100 components, the complete composition of suspect samples is not determined, only the major hydrocarbon components are identified. Comparisons are made between reference samples and the suspect samples.

Presently, chromatographic (TLC) analysis of the dyes in gasoline is being investigated. The information obtained is currently used as investigative information and not as court evidence.

To preserve the evidence, we request that the arson material be collected in glass jars with a cellophane seal, metal cans with air tight lids, and for larger items we request the use of plastic bags.

Specific procedural information can be supplied for future publications.

Sincerely,

William R McAtee

William R. McAtee
Criminalist III

WRM:vk

CRIME LABORATORY
PENNSYLVANIA STATE POLICE
4320 Iroquois Avenue
Erie, Pa. 16512

September 3, 1976

I basically rely on two instruments when analyzing evidence from arson cases. I have a Perkin-Elmer 900 Gas Chromatograph equipped with a 1/8 inch metal column, 10% OV-101. The parameters I use are as follows:

1. Heluim (carrier gas) 56 PSI, flow rate 4.0
2. Hydrogen-22 PSI
3. Air-30 PSI
4. Program- 70° to 280° at 12°/minute.
5. The amplification and attenuation vary depending on the samples that I am working with.
6. The chromatogram is from a Perkin-Elmer Recorder-Coleman 165. The chart speed that I prefer is 10mm/min.

The other instrument that I use frequently is a Perkin-Elmer 710 Infrared Spectrophotometer. However, I rely primarily on the Gas Chromatograph to identify trace materials from arson cases.

When I receive evidence from a fire, I prefer it to be sealed in canning jars. If it is a pure liquid sample, identification is relatively simple. The majority of evidence however is pieces of wood or other materials that are partically burnt. The first method that I try is Headspace Analysis. I place the canning jars in a sink partially filled with very hot water. I will let it set for about four hours. I punch a small hole in the lid of the jar and remove my sample into the ~~column~~ syringe. I inject the sample into the column of the G.C. Sometimes I will have to inject five or six samples before I find the correct attenuation to record an interputable chromatogram. The second method that I sometimes use is Distillation. Many times, especially when the accelerant

was gasoline, I will obtain a distillate with two phases. Identification is again relatively simple when I have a pure sample. When I don't have two phases, I extract the distillate with a small amount of chloroform and inject a sample of my extract into the column of the G.C.

In every case, I base my conclusion on the amount of hydrocarbons and the time that they come out of the column. For comparison, I run blank samples of the materials that I am testing and known samples of different accelerants. I will report myfindings three ways. I will report out a certain substance being present if I have been able to isolate it in a pure form. If I don't have a pure sample I will report that I have detected hydrocarbons commonly found in a specific accelerant. If I am not sure that I can make a comparison, I will report that I detected hydrocarbons but was not able to identify any common accelerants.

I am often asked in Court to make judgements about the age of the samples that I have tested. At the present time, I find it difficult enough to identify common accelerants, and I don't testify concerning the age of the material that I have analyzed.

Sincerely,

John A. Robertson

John A. ROBERTSON
Criminalis t II

Form 7128

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Your Reference No.....

METROPOLITAN POLICE FORENSIC SCIENCE LABORATORY,
109, LAMBETH ROAD,
LONDON, SE1 7JH
Tel.: 01-230 1212

7th September 1976

[redacted]

We were most interested to hear about the proposed arson application newsletter and appreciate having our attention drawn to it. We are always pleased to know of others working in a similar field and we certainly wish the newsletter every success.

At the moment this laboratory deals with about 400 suspected fire-raising cases a year which includes some 150 visits to the scene by laboratory personnel. Nearly all cases involve subsequent analysis of fire debris in the laboratory usually by a distillation procedure followed by capillary-column gas chromatography.

We look forward to hearing more about the newsletter and its contributors.

Yours sincerely

David Willson.

D Willson
Senior Scientific Officer
for the Director

State of South Carolina

Law Enforcement Division

JAMES B. EDWARDS
Governor

J. PRESTON STROM
Chief

P. O. Box 21398 Phone 758-2461
COLUMBIA, S. C. 29221

September 9, 1976

The Chemistry Laboratory of South Carolina Law Enforcement Division is responsible for analysis of any type of evidence submitted by law enforcement agencies in South Carolina. These include drugs, toxicology, arson, fibers, paint comparisons and glass analysis.

For arson analysis, we have available gas liquid chromatography, infrared spectrophotometry, NMR, GS-MS, and gas chromatography are used routinely.

Arson evidence is usually submitted in glass containers. For gas chromatography, the sample is heated in the original sealed container with a 250-watt infrared heat lamp from a distance of approximately 0.5 m. A headspace sample of about 1 ml is analyzed on two columns under the following conditions:

Instrument: Perkin-Elmer Model 900 GC equipped with dual flame ionization detectors

Injector Temp.	200 degrees C
Maniford Temp.	200 degrees C
Hydrogen Pressure	22 lb/in^2
Air Pressure	30 lb/in^2
Carrier Flow	30 ml/min.

Column 1: 12 feet stainless steel 1/8" O.D. packed with 10% OV-101 on Chromosorb P
Temperature programmed from ambient to 225 degrees C at 16 degrees/min.

Column 2: 6 feet stainless steel 1/8" O.D. packed with octadecane-Porasil C
Temperature programmed from 50 degrees to 260 degrees at 12 degrees/min.

Retention time and peak area information is also recorded using a Perkin-Elmer PEP-1 data system.

This data is compared to gas chromatographic data for a large variety of known samples.

Headspace air is also extracted and transferred to a 10 cm gas cell and run using a Perkin-Elmer 567 Infrared Spectrophotometer. This IR spectrum is also used, where possible, to confirm the presence of hydrocarbons.

Sincerely,

Ronald E. Baldwin

Ronald E. Baldwin
Chemist

REB:dnn

香 港 政 府 化 驗 所
法 學 部
香港軍器廠街警察總部美意大厦

FORENSIC DIVISION,
GOVERNMENT LABORATORY,
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POLICE HEADQUARTERS,
ARSENAL STREET,
HONG KONG.

本署檔號 OUR REF.: GC 710/70

電話 TEL.: 5-284284 EXT.

24th September, 1976.

This laboratory is involved in the investigation of all fires where criminal intent is suspected. Samples of debris coming into the laboratory are accepted from both police and fire service sources as well as the result of visits by experienced laboratory personnel to the scene. Generally we will not accept samples arriving in improper containers such as paper bags etc, and it is constantly necessary to instruct officers in the manner in which a sample of debris should be taken and packed.

Depending on circumstances and the sample, we make use of both headspace and extraction techniques before final G.C. analysis.

We rearly use the Macoun alcohol digestion method of extraction but commonly use the Brackett steam-distillation method, distilling into a modified water-cooled Deane & Stark receiver and extracting with research grade Pentane or Hexane when necessary. A typical G.C. analysis would be :-

0.1 ul injected into a Perkin-Elmer F 17 fitted with matched 3m. Carbowax 20M columns, programming from 60-180°C at a flow rate of 30 mls/min. The programming steps would vary depending on the material suspected but typically for Kerosene the steps would be 2 mins at 60°C, 4°C per minute to 180°C followed by 8-20 minutes at 180°C.

The method is successful in distinguishing 'burnt' kerosene from "weathered" kerosene, but to distinguish between grades of petrol, and brands of kerosene (six quite distinct varieties are readily available in Hong Kong), and other more refined comparisons, we then make use of 50 ft. stainless steel S.C.O.T. columns, (pre-packed by Perkin-Elmer), Apiezon T having given us best results so far. For extreme resolution we use our own glass capillary columns which are approximately 50m in length and wall-coated with OV.1 or OV. 17. Coating the columns is an art but we have now standardised on treatment of the capillary with graphite powder before using a dynamic pressure method to coat with the stationary phase. The method reproducibly splits kerosene into upwards of 200 components.

Presently we are engaged on a promising development programme to simplify and speed-up the analysis of arson debris.

Basically the method depends on the aspiration of the sealed debris container in a warm oven with clean air passing the effluent vapour through a micro quartz tube packed with a molecular sieve. Hydrocarbons are entrained on the sieve and then released by heating the quartz tube to 250-300°C in a Pyroprobe 190 injection assembly fitted to our standard G.C.

Eventually when time allows and optimum conditions have been worked out, the results will be published.

Yours sincerely,

(R. Edgley)
Acting Government Chemist

AAN literature

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