Computer program could help solve arson cases

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University of Alberta researcher James Harynuk (right) and RCMP scientist Mark Sandercock have developed a computer tool to help get quicker answers on whether gasoline was used in deliberately set fires. Credit: University of Alberta

Sifting through the chemical clues left behind by arson is delicate, time-consuming work, but University of Alberta researchers teaming with RCMP scientists in Canada, have found a way to speed the process.

A computer program developed by University of Alberta chemistry

professor James Harynuk, his team of graduate and undergraduate researchers and the Royal Canadian Mounted Police National Forensic Laboratory Services, can cut the need for extra levels of human analysis, reducing the waiting time to find out the cause of a deliberately set fire.

That means quicker turnaround on answers for fire investigators, said Mark Sandercock, manager of trace evidence program support for the RCMP's National Forensic Laboratory Services, and a co-author on the research.

"Having results back in a timely way on physical evidence can only improve an investigation," Sandercock said. "By getting the laboratory results back quickly, investigators can use this information to ask the right questions when interviewing people or evaluating other evidence, which will help them resolve the case more quickly by pointing them in the right direction."

The U of A study, published recently in *Forensic Science International*, is the first to use a mathematical model to successfully classify debris pulled from suspected arson scenes, going beyond research based solely on simulated debris.

Harynuk's team began working with the RCMP's forensic lab in 2008, looking to develop tools for interpreting chemical data. Arson investigation was a logical fit.

"Arson debris provides an interesting set of samples because it is uncontrolled," Harynuk said. "You never know what is going to be in the fire, or how it started. Paint thinners, gasoline, kerosene are all very complex mixtures, and we wanted to develop a tool that would be able to pick a complex signature out of an equally complex background."

Volatile compounds released in a fire can mask the vital chemical data

that RCMP scientists need to pinpoint, Sandercock noted. "It can be like looking for a needle in a haystack."

Currently, an RCMP forensic scientist examines data from a sample, which is then re-examined by a second scientist to see whether they agree on the findings—a process that can take hours per sample. The average arson investigation yields three or four samples.

The technology developed at the University of Alberta would allow the first scientist to run findings through the computer program, getting an answer in seconds. Only if the computer gave a result different from that of the scientist would the debris sample go to a second human analyst.

For their work, Harynuk and his team focused on gasoline, the most commonly used ignitable liquid in arsons. They analyzed data from 232 chemical samples provided by the RCMP's lab services, drawn from fire debris in cases under investigation across Canada. From chemical profiles taken from burned carpet, wood and cloth, they were able to develop a computer filter that isolated the signature of gasoline in the data. This signature was then used to indicate whether or not gasoline was present in the debris sample, a possible indicator of it being used to start a fire.

"It's a system that is quite accurate and goes down a similar investigative path that a human would when looking at the data," Harynuk said.

Provided by University of Alberta