

# When Routine Lab Testing Isn't Your Best Friend



## Watson's Notes

Innovative Solutions for Difficult Problems

**"You have recently been in Afghanistan, I perceive"**

With these words was born the most famous team in detective fiction; Sherlock Holmes and his trusted comrade and biographer, Dr. John H. Watson.

In the spirit of Watson, who chronicled the exploits of Holmes, we have created this newsletter named "Watson's Notes".

In the pages of "Watson's Notes", modern day scribes document the discoveries, unusual cases and other news of Investigative Science Incorporated, our scientific consulting firm in Burlington, Ontario, Canada.

Please contact us if you have comments, and please read on.

**ISI** INVESTIGATIVE SCIENCE INCORPORATED

Scientists and Technical Consultants

1050 Cooke Blvd., Unit 2

L7T 4A8

(905)634-4200

mail@investigativescience.com

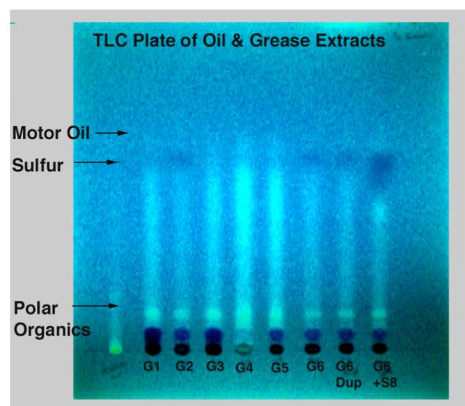
www.investigativescience.com

You would think that requesting a routine analytical test would be just that. Routine! But in fact, as the following examples show, a routine test poorly done, improperly applied or misinterpreted can become your worst nightmare.

### CASE #1; Routine Lab Test Fooled by Common Industrial Product.

During the decommissioning of an industrial site in Ontario, the process was halted by the Ministry of the Environment when results showed the soils on the site exceeded the guideline for Oil and Grease, a general parameter which includes petroleum hydrocarbons. The soils had been tested by a local lab using a common solvent extraction/gravimetric approach. The industry on the site had never handled oil products and contacted ISI to get to the bottom of the problem.

On conducting work in our own lab, we discovered that the soils were indeed free of petroleum hydrocarbons when analysed by the more sensitive and specific GC/MS method. So why the high results in the less specific gravimetric assay? Oil & Grease extracts were prepared in our lab from soils provided by the client. On weighing the extracts, it was discovered that indeed large amounts of solvent extractable material were present. To determine what this material was, we used a less well known chromatographic technique, Thin Layer Chromatography, or TLC. TLC has the advantage of visualizing everything in the sample.



Our analysis showed that the samples contained large amounts of polar organic plant material, which ran near the bottom of the TLC plate, and elemental sulfur (S<sub>8</sub>), which was only visible when illuminated using UV light. Sulfur, which was used at the site, and the polar plant materials, were clearly extracted by the test solvent and contributed to the weight of apparent Oil & Grease.

The elemental sulfur component was found to be removed when the samples were treated with mercury. The polar organics were removed with silica gel. The standard oil and grease test performed initially by a local lab used neither of these clean-ups. Both are recognized techniques and are allowed, but due to cost they are usually not offered or requested.

The bottom line in this case, was that by performing two additional cleanup steps to remove interfering chemicals, the soil samples passed the criteria and the decommissioning proceeded to completion.

### CASE #2: Factory Owner Accused of Arson Based on Incorrect Interpretation of Chromatographic Data

In the early 1990's, a chopstick making factory burned down. Based on evidence collected by the RCMP, the owner was charged with arson. The evidence hinged on the apparent detection of gasoline by gas chromatographic analysis of samples collected at the scene.



ISI was retained to review the evidence. On review, it was clear that the interpretation of the chromatograms was incorrect. Several

## ELEMENTARY MY

DEAR  
WATSON

Holmes and Watson go on a camping trip, set up their tent, and fall asleep. Some hours later, Holmes wakes his faithful friend.

"Watson, look up at the sky. Tell me what you see."

Watson replies, "I see millions of stars."

"What does that tell you?"

Watson ponders a minute. "Astronomically speaking, it tells me that there are millions of galaxies and potentially billions of planets. Astrologically, it tells me that Saturn is in Leo. Timewise, it appears to be approximately a quarter past three.

Meteorologically, it seems we will have a beautiful day tomorrow. What does it tell you?"

Holmes is silent for a moment, then speaks. "Watson, you idiot, someone has stolen our tent!"

key requirements for the identification of gasoline, and indeed any other accelerant, were missing. Based on our report prepared for the defendant, the case was thrown out of court.

### CASE #3: Test Results used against a Landowner During Sale of Property.

A husband and wife inherited undeveloped property in Southern Ontario. They decided to sell the property to an adjacent business. The buyer conducted an environmental review. Soil test results indicated the presence of petroleum contamination in the heavy hydrocarbon range, exceeding the Ontario EPA guideline. The potential buyer claimed that since the property was contaminated, the sale price should be reduced by about 25%, potentially costing the owners hundreds of thousands of dollars.

The owners retained ISI. We suggested that the test results be reviewed for authenticity. On review of the results, it was clear that the "petroleum" contamination resided in the so-called "F4" fraction of the routine test done by most labs for hydrocarbons in soil. This fraction is determined by weight and typically no attempt is made to identify it. ISI visited the site and found asphalt, as can be seen in the photo.

Experiments conducted on samples from the site showed that the F4 "Contamination" was, in fact, asphalt, for which there is no restriction. Armed with this information the property owners were able to realize the full market value of their property.

### CASE #4: Chemicals Added to Deliberately Fool Standard Tests.

This problem is becoming more prevalent as we depend more and more on foreign imports. There are many documented cases of

deliberate chemical substitution but one of the most blatant is the addition of melamine to wheat and milk products. Melamine was first detected in wheat gluten produced in China for use in pet foods. Many animals in North America died. More recently, melamine was found in milk-based infant formula produced in China. More than 1000 babies became ill.



### Melamine

In each case, melamine was added to fool a test for protein. In the food test world, a general test for nitrogen is used to determine the protein content of wheat and dried milk products. You will notice in the picture that melamine contains lots of nitrogen, represented by the "N"s in the diagram. In fact, each melamine molecule contains 6 nitrogen atoms. That is about as many nitrogen atoms as you can pack into a small molecule. In this case, the addition of melamine would raise the apparent protein content of the product. This would allow the seller to sell product that was failing on the protein content, or perhaps get a better price. We're not sure. The key point here is that melamine is toxic. It was deliberately added to enhance the "value" of the wheat germ.

For more information on this topic visit our website and click on "Toxic Chemical Substitutions".

### So what can you do to avoid these kinds of situations?

It is clear that simply relying on routine testing without appropriate expertise and oversight can get you into hot water.

**Investigative Science has been helping our clients avoid exactly this sort of problem since 1991. Call ISI before you test.**