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CSI:LA

LAPD

The Trace Chase

The Trace Analysis Unit, part of the LAPD's Scientific Investigation Division, fights crime through paint, shoes, tires, fibers and other evidence.

— SEE PAGE 6

ABOVE: Sue Brockbank, Supervising Criminalist for the Trace Analysis Unit, holds a shoe impression in one of the unit's labs at the Herzberg-Davis Forensic Science Center.

Alive! photo by John Hawkins

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Alive! Feature

LAPD

The Trace Chase

■ The LAPD's Trace Analysis Unit looks at fibers, tool marks, paint chips, shoes, tires, arson remnants, gunshot residue and other objects to help solve crimes, or free the innocent.

ABOVE: Sue Brockbank, Supervising Criminalist, 25 years of City service, holds a cast of a shoe impression and explains how they are analyzed in the Trace Analysis Unit.

Photos by Tom Hawkins, Club photographer; John Burnes, Alive! *editor; and John Hawkins, Club CEO*

If you're intent on doing something bad in the City, be careful what you leave behind: the LAPD's Trace Analysis Unit will be on the job.

The Trace Analysis Unit examines, identifies, and/or compares hair, fiber, paint, glass, accelerants, explosives, gunshot residue, shoe/tire and tool impression evidence, hazardous chemicals (clandestine laboratory analysis) and performs analysis of other miscellaneous chemical and physical evidence.

These analyses are performed to provide a description of or identify questioned evidence, and/or compare questioned evidence and known materials. When unusual types of evidence are encountered, the unit researches and develops methods for its analysis, and analyzes it. The unit also uses the Shoeprint Image Capture and Retrieval (SICAR) system, a computerized database of shoe outsole designs that assists in the identification of possible makes/models of shoes that made shoeprints at a crime scene.

The methods used to examine the evidence include macro- and microscopic examinations and comparisons, chemical analyses, and using sophisticated instruments for determination of chemical and physical properties.

In addition to their duties specific to the Trace Analysis Unit, staff members also testify in court as needed; teach in LAPD detective training schools; consult with detectives, the LAFD arson investigators, district attorneys, other criminalists, and other members of the Scientific Investigation Division (SID); provide training on trace evidence to other criminalists; assist the Field Unit with tours, assist the Narcotics Analysis and Alcohol Analysis Units when needed, provide roll call training, and perform quarterly safety audits.

There's a lot going on in the Trace Analysis Unit. On the following pages is how they do it. ■

Trace Evidence

Here's how the Trace Analysis Unit analyzes the evidence that's brought in by LAPD Detectives.

Shoe Prints

Lisa LaHendro, Criminalist II, explains how the Trace Analysis Unit identifies shoe prints.

Evidence of a shoe tread is brought in to the crime lab as a high-res crime scene image, or a cast (see cover), or an actual shoe, which is scanned. The image is then entered into powerful software. The software offers a number of textures and locations, and the analyst enters the information into the software. For example, Lisa here is indicating that the shoe in question carries a cross-line pattern characteristic on the toe region of the sole.

After Lisa has input all that she can into the system, the database returns with several models that fit that description. In this case, Lisa agrees that one of the software's suggestions is the correct one – this shoeprint comes from a Nike Draft Pick II, released in March 2000. The database contains more than 21,000 individual shoes from more than 700 manufacturers, and is updated quarterly.

The criminalist's input is critical, because shoes stretch and modify as they are worn. The software can only make suggestions. (This example was a training sample and not an actual case.)

Tool Marks

ABOVE: Evidence that contains marks made by tools (hammers, screwdrivers, etc.) is also important to a case. A major difference with tool marks is that they are in three dimensions. They are placed under a special comparison microscope with strong lighting that is better equipped to handle three dimensions.

RIGHT: Sue Brockbank, Supervising Criminalist, displays how evidence containing tool marks is prepared in the lab. This evidence is mounted in clay for better handling on the microscope.

CSI:LA LAPD SCIENTIFIC INVESTIGATION DIVISION: Trace Analysis Unit

THE *ALIVE!* INTERVIEW

Better Than Glamour

■ On Monday, Aug. 15, Club CEO John Hawkins sat down to talk about Trace Analysis with Sue Brockbank, Supervising Criminalist, Trace Analysis Unit of the LAPD. The interview took place in the unit's conference room.

***Alive!*: Thanks for talking to us today, Sue. How did you get to your current position?**

SUE BROCKBANK: My career – wow. Let me think! I started as a volunteer with the L.A. County crime lab in 1985 following a lunchtime speaker at my school, who came to talk to our students association about forensic science. She turned me onto the whole idea of forensic science. So I started volunteering in the Sheriff's crime lab. Then I came to LAPD as a student professional worker in 1986, and then I hopped back to the L.A. County crime lab in 1987 as a laboratory technician. Then I came back to LAPD as a criminalist in 1987.

So I hopped back and forth. I really like the LAPD. I've been a supervisor for about five years. That's where I am.

More Than Meets the Eye

Can you give me a brief overview of trace analysis?

SUE: The Trace Analysis Unit does a wide variety of different types of analysis. We do analysis of impression evidence, things like shoe prints and tire tracks, tool marks. But those are the things you don't really think of as trace evidence. Typically trace evidence is evidence that's hard to see with the naked eye. The more traditional trace evidence items would be things like hairs and fibers, paint, glass. We also do analysis of ignitable liquids and fire debris evidence, explosives, gunshot residue – and basically any other type of evidence that isn't specifically analyzed by one of the other units of the lab. We're basically the catchall unit for any odd type of evidence that might be out there. When it comes to crimes, particularly homicides, you never really know what the evidence is going to be until you get out there. It could be anything. A murder weapon could be anything. So our analysis can involve a bit of research and development from time to time when it comes to things that we haven't seen before.

So your department looks at that evidence and analyzes it, and makes a determination. Do they go to court as an expert witness, or do they present the data, the information, to the detectives?

SUE: Yes. After we do our analysis, we're generally going to do a couple things. One would be, we're going to identify what something is. So in the case of an ignitable liquid case, we're testing some evidence and trying to identify what that ignitable liquid is. We're going to say, "The ignitable liquid present in this item was gasoline." Other times, we're doing comparisons. So with a lot of trace evidence, we're comparing a questioned piece of evidence, like some hairs or fibers in the victim's hand versus some known evidence, which would be the hairs from the suspect's head, or the fibers from the suspect's clothing. We compare those two things to determine whether they could have a common origin or not. Our analysis isn't definitive, like a fingerprint. We're not saying that this hair came from this individual and no one else. The only thing we can do is say that the hair is similar in the microscopic characteristics that we see, and it could have come from that individual. But on the flip side, we can rule out other people, and we can say the hairs are different [and] didn't come from that person.

Do you test DNA on that level?

SUE: With hairs we do, yes. But that's done either by [the LAPD's] Serology DNA unit, or they ship it out. We don't do DNA analysis in the trace unit. But we do a microscopic examination of the hairs, yes.

You look microscopically to see if there is a, "Do we proceed with this?"

SUE: Yes. It's kind of like when you just look at a person. You've got short brown hair. I've got long, multicolored hair. Only my hairdresser knows for sure. So just to the naked eye, you can see differences between our hair. When we look at that under the microscope, those differences are even going to be bigger. You're going to see that there are differences. If one of my hairs was in my hand and you were the suspect, I'd be able to say, "It's not your hair. I did a microscopic examination and comparison. The microscopic characteristics are different. It's not your hair."

Knowing the Background

How old is trace analysis? Was it here when you got to the LAPD?

SUE: Yes, it was here when I got here in '87; it was well established. The LAPD crime lab was formed in 1923. I know we're the first crime lab established in the United States, and I believe they were doing trace evidence even back then.

Back in the day, what would they have been looking for? Probably hairs?

SUE: We've had microscopes for hundreds of years. They probably did things on soil and paint. What's interesting, going back 50 years ago – the criminalists working then would go a lot further with their opinions I think than we do today. They'd analyze the dirt in somebody's pocket and say, "Oh, this guy was working in a machine shop that made batons," or something crazy. They'd just go really specific. And now, because of all the levels of review that we go through, we have to really have our supporting documentation. Sometimes we still go far with our conclusions, but the supporting evidence has to be there to back that up.

Do you always know the background of the case?

SUE: Not always. Sometimes we know some real general idea about what the case is. But we don't always know the specifics. There are some people that feel that knowing all the specifics of the case can bias a person.

Bias it one way or the other.

SUE: Yes. I don't really feel that it does. I want information. Comparing A to B without knowing the context of those items doesn't really mean as much to me.

You'd lose connectivity.

SUE: Yes. If they say, "Compare the hair in the victim's hand to this suspect," and I say, "Oh yes, they're similar," out of the context, what does

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Fibers

Fibers can be compared through a microscope, but they also can be analyzed with a powerful Spectrometer (pictured below).

BELOW: Matt Franzman, Criminalist, displays an array of slides containing fibers or paint samples.

ABOVE: The fibers are loaded into an FT-IR, a Fourier Transform Infrared Spectrometer, where the fiber's chemical composition can be analyzed. The instrument scans the fiber, and a readout is displayed. The instrument connects to a database, and different samples can also be displayed that might be similar to the unknown fiber that has been scanned. This method helps identify what kind of fiber it is (hair, nylon, etc.). Demonstrating this method is Lisa LaHendro, Criminalist II, 11 years of City service.

Chemicals

Analyzing unknown chemicals or materials is a difficult challenge for the Trace Unit. What is this stuff? But with new equipment and a new employee to administer it, the Trace Unit is on the job. Demonstrating this capability is the new employee, Matt Franzman, Criminalist.

BELOW: Matt Franzman inserts the chemical or material in question into the X-ray diffractometer, which scans the material.

ABOVE: The machine produces a readout, which tells the analyst whether the material is crystal or otherwise, man-made or natural, metals or powders, organic or otherwise. Once the material is identified, other analyses can be done.

– continued page 8

Alive! Feature

THE *ALIVE!* INTERVIEW, continued

that mean? Well, I find out the victim was found lying on the bathroom floor, and the floor is covered with hair, the suspect's her husband. To me that means nothing. So what if she had hair on her hand that matched her husband? That doesn't mean he was the killer. But if you take that out of context without any information at all, I think that's a really bad road to go down.

Hard to Test

What's the hardest thing to test, and why?

SUE: I was thinking about this earlier. I'd say the hardest thing – and I think one of our new employees is going to change that – would be those miscellaneous chemistry cases, where they just have some unknown chemical and they want us to identify it, like in a poisoning type of situation.

Let's say someone thinks that their soft drink they had on their desk at work was poisoned; somebody poisoned them. We don't have any real set methods on it, so it involves a little research and development to come up with a method on how to test. Every time you get one of those types of cases, the matrix – in the last example, a soda can – is different from case to case.

So is it safe to say then the chemical nature of things is the hardest? They take more time and expertise, skill, and years on the job?

SUE: It takes more time, more expertise, more skill, yes… and a wide variety of instruments are used. And so that's why I said our new employee, Matt [Franzman] may be changing that because Matt has extensive instrument experience. He's a true analytical chemist, and I think he's really going to help us in that area.

A Case to Remember

***Alive!*: Do you remember a really interesting case? Something that really sticks in your mind?**

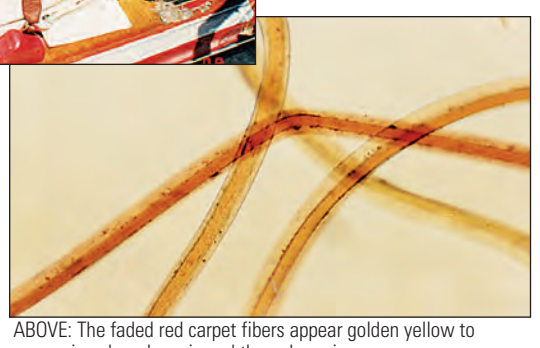
SUE: Yes, there's one case that's near and dear to my heart. It happened in the mid 1990s. A little girl was kidnapped – in the middle of the night, a girl disappears out of her bedroom. The girl was missing for about a week before she was found. But during that week, the detectives had developed a suspect who happened to be the girl's uncle. They searched the uncle's car, and they found a little bit of blood in the trunk of the car.

ABOVE: The interior of a suspect's car shows its badly damaged and faded red carpet, red floor mats, and red carpeted door panels.

So they find the body. The girl is partially covered with the comforter off of her own bed. The comforter came into the lab, to me, before I was a supervisor, when I was actively doing lab work. I removed hairs and fibers and all the debris that was on that comforter, and collected it all in a little Petri dish. I look in that Petri dish to see what's there.

Because there was some blood in the trunk of the suspect's car, the detective on the case thought the girl had been transported in the trunk of the car. He asked me if we could do a fiber comparison between the trunk fibers and the contents of my little Petri dish. The trunk had black carpet in it. So I was looking for black fibers. I didn't find any. But I found a bunch of red fibers. So I call the detective and told him that. And he says, "Well, the whole interior of the car is red."

As it turned out, the suspect's car had really badly faded carpet in it, so the tops were a golden yellow color, and then it went to an orange, and then at the bottom it was still red. In the Petri dish, I had whole fibers. I actually had the fibers that went from the gold to the orange to the red to the orange to the gold. We got a search warrant to go back to the car and collected more carpet fibers.



ABOVE: The faded red carpet fibers appear golden yellow to orange in color when viewed through a microscope.

When I did the fiber comparisons, I found fibers that matched the floor mats, the carpet, and the carpeted door panel. There were about 10 or 15 different fiber types present, and all of those were present on the comforter – as well as present in the suspect's car. So even though, with trace evidence, all I could say is that they were similar and could have come from that car, the odds that they came from something else were slim and none. I don't believe they came from anywhere else.

It was just an awesome case. The suspect was convicted and got the death penalty, and is still waiting on Death Row all these many years later. The fiber evidence played a big part in that, along with the blood, that turned out to be the victim's blood inside the trunk lid. There was also the suspect's palm print on the doorjamb to the girl's bedroom. With those really three key pieces of evidence, this guy was convicted. It shows how powerful fiber evidence can be. Even though it's just associative evidence, it can really tie a case together and tell you what happened.

A Science (Mostly)

Is this an art or a science? How much hunch is involved?

SUE: It is a science, and as far as hunch, I'd say it's pretty much no hunch.

No hunches?

SUE: Well, I don't know. Let's say you have a footwear case – I don't know if you'd call this a hunch, but one of the first things you do is you look at that questioned shoe print at the crime scene, and you look at the outsole of the shoe and see if the two even look similar. So if you want to call that a hunch, I guess there might be a little hunch involved. But it's just a preliminary evaluation. We're always going to start with that preliminary evaluation.

I don't see it as an art. I do see it as science.

Let's ask it this way: What makes a good analyst?

SUE: To be a well-rounded analyst, you have to have a really good analytical brain, to be able to analyze a situation, to see what's important and

Trace Evidence — continued

Gunshot Residue

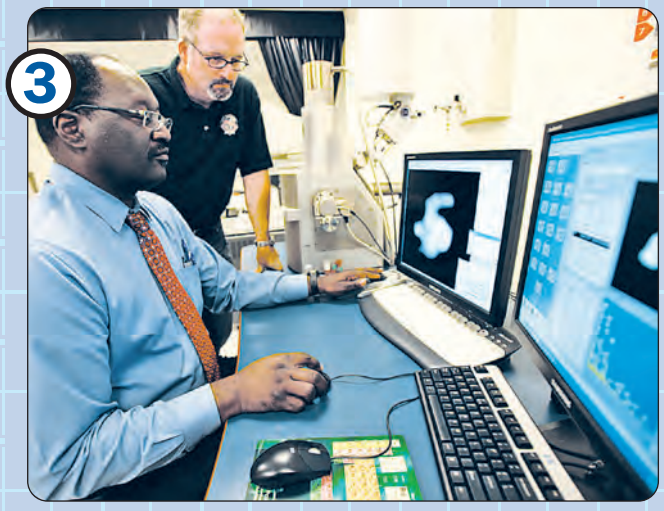
Kevin Hollomon, Criminalist II, 20 years of City service, looks for trace evidence of gunshot residue by using a scanning electron microscope.

ABOVE: Detectives collect possible residue from the hands of a suspect using adhesive coated metal pads.

ABOVE: The analyst places the pad in the scanning electron microscope.

BELOW: A special piece of software (right monitor) is used to manage the electron scan.

The electron microscope scans the evidence. Displayed on the left monitor is the product of that scan; Kevin's training tells him that this scan shows gunshot residue. Looking on is *Alive!* editor John Burnes. (This sample is from a training exercise and not an actual case.)



Paint Chips

Sue Brockbank, Supervising Criminalist, demonstrates how paint chips are analyzed.

ABOVE: Here, a paint sample from evidence is placed under a comparison microscope. Criminalists can then visually compare the evidence sample with a sample from a known source, side by side, to help determine if the two shared a common origin.

CSI:LA LAPD SCIENTIFIC INVESTIGATION DIVISION: Trace Analysis Unit

what's not. You have to have a good science background so you can use those instruments, because we have a lot of different instruments in the trace lab. You need to be able to use a lot of these instruments and use chemistry and biology, because those are the main areas that trace evidence has to do with, and apply those to the evidence.

When it comes to making those evaluations, and with footwear and impression evidence in particular, looking at patterns and pattern recognition, I think there is an aspect of an art there. I don't believe everyone has the eye for that type of analysis. There's other training and other skills that come together there.

The Challenge of TV

What's the biggest challenge? Is finding people a challenge?

SUE: Finding people is the biggest challenge, for my unit right now at the LAPD and in general across the nation as far as trace evidence goes. It's really overshadowed by DNA. DNA is just larger than life. It's in the news all the time. It's not a bad thing, because DNA is a powerful tool. But in the Trace Unit, we need people, too.

People that have those analytical skills.

SUE: Right.

Compare what you do in reality with the *CSI* shows. If you're at a cocktail party, what do you tell people?

SUE: Well, obviously a case doesn't go from start to finish in an hour. So we can't solve a case for you in an hour.

It's not as glamorous. You see the women and the men on *CSI*, and they're all glamorous. We're not glamorous here. Some of the things we do are downright disgusting, the evidence you deal with from bodies that have been decomposing, for example – it's not pleasant. Anybody that says it is, is lying to you. It's not pleasant.

What about the computer graphics? I'm here, and I know you don't walk into a darkened room with 15 giant flat-panel monitors on the wall.

SUE: Right. And on TV, they'll take a piece of evidence and put it in a machine, and out the other side comes a result telling you what it is.

Right, making a noise.

SUE: Exactly, that little *Star Trek* computer noise. And you get the answer out the other end. In real life, there's actually preparation involved. You have to prepare a sample. You can't just throw it in an instrument and get an answer out the other end. You have to compile all that data and see what it really means, and the human factor is the one that tells you, "here's what that data tells me. Here's the answer."

Have those shows actually helped in a way? Do people now seem to be really interested?

SUE: The field of criminalistics has just boomed since the *CSI* shows because they have brought a lot of interest to the field. Interest in the field is just huge since that show came on, and all the other shows that have sprung up since.

Also, the attention is on many levels. It's brought resources to the crime lab that might have been lacking in the past.

Great Staff, Great Passion

How do you see your staff? Are these your heroes?

SUE: I am very biased, but I think I've got the best staff in the crime lab. I've got the cream of the crop. They're really thorough and dedicated to doing their job. They come every day with a smile on their face and get the job done. I couldn't ask for better employees. I really couldn't. I think they're the best.

Club CEO John Hawkins interviews Supervising Criminalist Sue Brockbank in the laboratory's conference room, where numerous books and journals are kept available for reference by analysts.

What do you love about your job? What do you love about what you do?

SUE: I like the field, and the people I work with. It's really easy to come to work when you have a great staff of people.

Trace analysis to me is the real criminalistics. And this will probably offend people in other units of the crime lab. When you see *CSI* and a lot of the neat stuff they do on TV, a lot of that is what we do in the Trace Unit. We do a variety of different types of analysis. I like the variety.

Thanks, Sue, for your time.

SUE: You're welcome. ■

SPECIAL THANKS!

Alive! thanks the crew in the Trace Unit, and especially thanks veteran LAPD criminalist Linda French, Criminalist III, 22 years of City service, who does not appear in these photos.

Accelerants

The Trace Unit also analyzes material from fires to try to determine if an accelerant was used (indicating possible arson), and what kind the accelerant might be. Demonstrating the accelerant analysis is Grais Banks, Criminalist II, 5 years of City service.

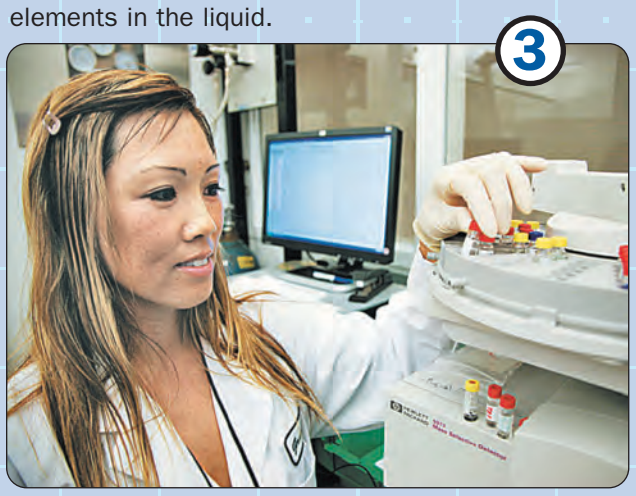
1

ABOVE: The evidence is packaged in a metal can.

2

RIGHT: Grais places a charcoal tab into the evidence canister to absorb the vapors.

BELOW: After chemically treating the material from the charcoal tab and turning it into a liquid, she places the material into a GCMS (gas chromatograph mass spectrometer) to analyze the elements in the liquid.



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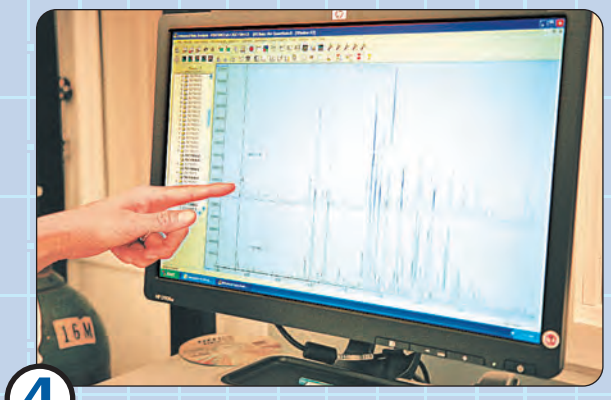

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ABOVE TOP: The instrument generates a readout (data).

ABOVE BOTTOM: The analyst then must manually decide which material it resembles. Grais has a large selection of common accelerants that she can also scan, and then compare the readouts. Once she has found a match, she can then inform the detective that she has identified a certain accelerant, or none at all, or that it's inconclusive.