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The Forensic Teacher Magazine

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By now your students have settled in, you’ve guided your class through a number of units, and the holidays are approaching. You’ve likely got an idea of what you want to do with your students after New Years, and may or may not have everything ready. The reason I bring this up is because it’s easy to fall into the trap of doing what works, of playing it safe. Don’t get me wrong--I’m not suggesting you abandon teaching methods you’ve used for years. I’m only suggesting that when you pack up for the holidays that you think a little recklessly about the rest of the year, starting in January.

If you’ve taught forensics before you have an order to the rest of the units you usually proceed through as you count down until the end of the year. Do what works for you, but please think seriously about shaking things up a bit. I’m not advocating revamping your curriculum, especially if it works. I’m not saying you should abandon those labs your students love, or that you’re particularly fond of. I’m only asking you to ask yourself how you can make things better, and to act on the answers.

A course should constantly be evolving. It should get more meaningful and thought provoking every time you teach it. The first time we teach a subject most of us are just trying to stay a week ahead of our students. Give us a few years and we’ve definitely made it meatier; we’ve made it our own. But when do you stop adding to it?

You have a list of units you’re going to tackle in 2011, and the activities and labs that go with them. Most of us are going to use the same supplies we always have. Why not? They work and new ones cost money our school doesn’t have. But engaging students doesn’t have to be about flash and bling.

Our students love mysteries. They love steeping themselves in the clues. They think they’re pretty good at finding and analyzing evidence. And we all have one or two kids who aren’t shy about letting us know they’re sure they’re Sherlock Holmes reincarnated.

This spring do something different. It can be as little as a new, sinister introduction to a unit. It can be a local spin on a crime scene. It could be a new criminalistics scenario you found in a book or CD, some of which are mentioned in our book reviews this issue.

Students talk. The ones in your course have been told what to watch for and what to watch out for by last year’s kids. The effort you put into adding something new will add to the mystery of your class.

And isn’t that what legends are made of?

Dr. Mark Feil

Our planet is shrinking and crimes against wildlife and the environment garner greater awareness than in the past, especially by young people. If an educator wants to focus the intensity of CSI on crimes going on every day in the world around them, this book is a perfect match. Ms. Arndt has done a great job of showing readers how to take their students through forensic training, and then loosing them on poachers.

The book is divided into four sections, all well thought out, and thoroughly covered. Ms. Arndt includes lesson plans, material lists, procedures, teacher guidelines, relevant web links, reproducible worksheets, effective graphics, content background, references, unit answers, and assessment tools, as well as connections to National Science Education Standards in every unit. The layout is simple, but effective, so reading is a pleasure for both teacher and student.

The first section gives the reader information about various protected animals and environments. It also provides background on how and why people abuse animal populations, why poachers kill, and the reasons people engage in the illegal wildlife trade. Finally, the text explores the various laws designed to protect wildlife in various parts of the world, and how students can help.

The second part of the book is made of eight forensic modules designed to give the student experience in working with various types of evidence: antlers and horns, blood typing, DNA fingerprinting, hair identification, pH and its indicators, mammal skulls, and tracks and trace fossils. Each is complete enough that a non-forensics teacher (environmental, animal science, biology, etc…) with little forensics training can give his or her students the same appreciation of the application of science to the law that a forensics teacher can. And forensic teachers will be able to explore additional units (antlers and tracks for example) with their classes. In addition, the content in this book will add a new dimension to a typical forensics curriculum: after forensics students are done finding a murderer they can test themselves with a poaching case. Which brings us to the third section of the book: an illegal bear killing.

In this part of the book the reader and his or her students investigate a poaching based on a real case. Crime scene reports, interviews, timelines, logistical details, questioned documents, lab protocols, and evidence are provided so students can work in teams over an eight day period to solve the crime. This part of the book is far larger than any other section. The amount of detail demonstrated by the author in planning the scenario and activities is at once staggering and comforting. The author has made sure a class working through the book wants for nothing except a map of Colorado. Everyone must work together to solve the crime and bring his or her evidence to a DA for an indictment.

The last section of “Using Forensics: Wildlife Crime Scene!” is concerned with evaluations and assessments. The reader is guided through strategies for allowing students to both self-assess, and evaluate their group. An assessment tool for a lab practical is given, and a reminder about the fragility of wildlife populations is reinforced.

The book will be of great value to any science teacher who wants their students to learn about the environment and/or dwindling wildlife populations via an engaging, multidisciplinary, memorable way. Forensic teachers will appreciate the analyses not covered in a traditional forensics curriculum. And both will be amazed at the exercise that makes up the biggest part of the book.

Reviewed by Enrico Pelazzo

Books (continued on p. 5)
A trio of books from Kenneth G. Rainis. Sold by Frey Scientific (Freyscientific.com).

There are three books in this book review, which is unusual. However, since they’re all by the same author (Kenneth G. Rainis), sold by the same company (Frey Scientific), have the same number of pages (128), and all share the same format it only makes sense to lump them together, especially since all are well done.

I have to admit to being skeptical about these books when I first picked them up. Each is trade paperback sized and each cover is eye catching. But when I initially glanced through the books I was fooled into thinking they were a watered down version of a college forensics textbook, something a middle school kid might check out of the school library and read late at night under the covers with a flashlight. I couldn’t have been more wrong.

The first of these is “Forgery, Crime-Solving Science Experiments.” The first third of the book concerns itself with gaining and practicing forgery detection and questioned document examination skills. Color photographs and plain language make this an easy task. The other two thirds of the book is called the Inspector’s Casebook. It’s a collection of 10 cases and projects involving different scenarios spanning everything from ink analysis to indented writing to handwriting analysis to identifying pencil markings and much more. Photographs, diagrams, and concise directions make each more engaging than the last.

An actual case from history is used as the basis of a larger case the reader must solve by combining their skills. It is well thought out and the book finishes with a project analysis (answers and why they’re correct), a glossary, index, and a list of further reading.

**Books (continued on p. 6)**

![Win a ballistic analysis kit just for being honest.](image)

**The winner will be drawn January 22, 2011**

Time is running out if you want to be in the running to receive a Forensic Firearm Identification Kit from Precision Forensic Testing. The kit includes 10 bullets & 10 casings as well as a gun barrel sawed in half to reveal the rifling, plus PowerPoints, and teacher notes. This is a $230 value. All you have to do to be entered is go HERE and tell us what you think of The Forensic Teacher Magazine.

**Preserve the Evidence!**

![A trio of books from Kenneth G. Rainis. Sold by Frey Scientific (Freyscientific.com).](image)

A crime wave has hit the animal kingdom, and your students can help put a stop to it—even as they investigate the science behind animal-species identification and threats against wild animals.

**Using Forensics: Wildlife Crime Scene!** opens with an overview of crimes that threaten different wild animal species around the world. Next come eight forensic training lessons and a simulation for the students to play out!

To read a chapter, or to order your copy, visit www.nsta.org/store or call 1-800-577-5300.
Mini-Mystery
Murder at Big Jake's

IT WAS LATE IN the afternoon of a fine spring day when Thomas P. Stanwick, the amateur logician, waved Inspector Matthew Walker into the living room of his Baskerville bungalow. Stanwick, who was recovering from the flu, was dressed in pajamas, slippers, and a dark blue robe. Rufus, his black Labrador, looked up and flopped his tail when the two men entered the room and then the dog resumed gnawing a plastic bone. “Glad to hear you’re feeling better, Tom,” said Walker. He sat down and accepted a can of cold beer.

“I’m getting there, thanks,” said Stanwick with a weak smile. He sat down and put his feet on an ottoman. “Haven’t had the strength to do much more than read, but I’m behind on the newspapers. What’s new in city crime?”

“Well, let’s see.” Walker took a sip of beer. “A few nights ago, at about two A.M., a drug pusher named Valenzi was shot and killed on the sidewalk in front of Big Jake’s bar. A drifter named Albert Gummond was arrested near the scene.

“Although no one saw the actual shooting, witnesses in the bar have identified Gummond as having quarreled with Valenzi there shortly beforehand. Not about drugs, though—about a woman. Gummond left the bar immediately after Valenzi. The gun hasn’t been found yet, but Gummond had blood on his jacket when he was picked up. The blood is being tested.”

Stanwick lit his pipe. “Has Gummond made a statement?”

“Actually, he made several statements when he was sent over for psychiatric evaluation,” Walker replied. “According to the doctor who is checking him, he suffers from a rare psychological disorder, one of occasionally lying compulsively.”

“Occasional compulsive lying?”

“Yes,” Walker smiled. “In one variation of the disorder, the doc tells me, the patient lies every other statement. In the only other variation, the patient lies every third statement. The doctor can’t tell yet which variation Gummond has.”

“Extraordinary!” Stanwick’s eyes sparkled. “Do you happen to remember what he said?”

“I think I have it here,” replied Walker, extracting and flipping open his notebook. “Gummond made five statements:
1) I’ve never been in Big Jake’s in my life.
2) I’ve been in Royston for the last two weeks.
3) I didn’t shoot that Valenzi.
4) It is not true that I was in Detroit five days ago.
5) I own a gun, but it’s with my sister in Chicago.”

“Still undergoing psych eval;” said Walker. “Any thoughts?” “One or two,” Stanwick replied with a yawn. “For one, you can tell the doctor that Gummond suffers from the first variation of the disorder. For another, you can tell the chief that Gummond did the shooting.”

“Gummond made a statement?”

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How does Stanwick know this?

Answer on pg. 34

Stan Smith is the author of three books of Stanwick mini-mysteries that have been published in nine languages and sold over 120,000 copies. Learn more at www.stanwick-minimysteries.com.
Hot Sites

http://investigation.discovery.com/interactives/trace-evidence/game.html
Interactivity from Investigation Discovery; your students will definitely thank you for taking them here.

http://www.centredessciencesdemontreal.com/static/autopsy/
A fantastic interactive crime scene that lets you click on the evidence and find out how to photograph, collect, and test it. A must-have if your students have access to a computer lab.

http://www.exteriorballistics.com/ebexplained/index.cfm
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An interview with Tess Gerritsen.
Every one of Tess Gerritsen’s novels has a dead body in it, even the romances, and readers must love it because there are over 20 million copies of her books out there. Long-time fans will recognize Rizzoli & Isles as not only two of her best known characters, but as a new hit series on TNT. We caught up with her at her home in Maine to see what influence her teachers had on her.

By Mark R. Feil, Ed.D.

The Forensic Teacher: Tell me about your parents and their views on education.

Tess Gerritsen: Well, being from an Asian-American family it was very clear from the start what their views on education were. Traditionally, Asian-Americans really feel that education is the foundation for success in anything. So, I was encouraged from an early age to study hard, to read, and it was clear it was expected of me that I would go to college and probably pursue a professional degree. And I was an obedient little girl so I did.

FT: And you found yourself in medical school.

TG: I did. I wanted to be a writer when I was young. I knew I was going to be a writer when I was seven, but my father told me there was no money to be made as an artist of any kind, so he encouraged me to go into the sciences. And that may explain why there are so many Chinese doctors in the US.

FT: Are your folks still alive?

TG: My mother is still alive; she lives in town. My father died in 2007.

FT: What does she think of your new career now?

TG: She’s very proud of me. She actually came from a very wealthy family in China and was forced to leave because of the communist takeover. She ended up in the US kind of impoverished because of refugee status. But, because of her background the arts were something that she admired. So, she wasn’t as practical as my father was, and now that I’m a writer she thinks it’s wonderful.

FT: That’s great. And what kind of child were you? Obviously, you were pushed academically, but what kind of hobbies and inner desires did you have?

TG: Oh, I was a daydreamer. I spent a lot of time making up stories in my head, but I was really curious and I think that’s one of the most important qualities of a writer. You have to be curious about things. So, I was always in the canyon where we lived in San Diego, and I was always out there finding dead animals and cutting them open, just paying attention to the natural world.

FT: Did you have other friends like you?

TG: You know what? I was pretty much a loner. I still am that way, and I pretty much wandered around the canyon with my dog and that was it.

FT: Your inner workings were enough.

TG: Yeah, I’ve always been able to amuse myself; I never felt that I needed company for this.

FT: I know what you mean. I was the same way when I was a child. So, tell me, when you were in middle or high school, what teachers stood out in your mind and really made you want to learn?

TG: There was my English teacher who was the first to tell me, definitively, that I was a writer, and that I would be a writer when I grew up. She could see that; I think she knew that before anyone else did.

FT: That’s neat.

TG: Yeah, that was really, really cool.

FT: And how did that make you feel?

TG: It gave me confidence, and it made me think of myself in a different way. Up to that point it was a hobby, but she was the first to say, ‘This could be your career.’ So, she opened up that whole possibility to me that my father had firmly said was not a possibility. She did widen my horizons.

FT: Was she the first person to believe in you, creatively?

TG: She was the first person to express that, I believe. Although there was probably somebody in middle school who said that too. I had a history teacher who had remarked that my essays were particularly good, and I should be a writer, but I don’t remember that as well as I do her.

FT: Sure, they always stick in the back of your mind, the teachers who believe in you, and who challenge you, and you rise to their expectations.

TG: Well, they do. I think that high expectations cause students to reach higher. I think when you don’t expect much of them, that’s what they will deliver.

FT: That’s a very good point.

TG: So, then I had another teacher, and I dedicated my most
By Mark R. Feil, Ed.D.

set up a crime scene and the kids come in and find the foot-part is how much practical stuff they do with their kids. They State and they have a great forensics program, and the best

TG: I think practical stuff is important. I was just at Penn elective.

FT: And what kind of advice do you have for forensic teach-to make it relevant to a kid's life.

TG: And then whatever your lesson plan is, try and find a way FT: I hear that.

TG: And then whatever your lesson plan is, try and find a way to make it relevant to a kid’s life.

FT: And what kind of advice do you have for forensic teach-ers? A lot of high schools are now teaching forensics as an elective.

TG: I think practical stuff is important. I was just at Penn State and they have a great forensics program, and the best part is how much practical stuff they do with their kids. They set up a crime scene and the kids come in and find the foot-prints and the blood etc… And they bury a pig in the woods, and the kids have to learn how to exhum a body in any weather. So, sometimes they’re out there in miserable weather exhuming a pig as if it were a human body. It’s really cool. It’s stuff like that makes kids think, ‘Wow, I’m on a crime scene, and I’m learning how to do this stuff.’

FT: When kids are younger they want to run faster, play harder, and get the ball. They enjoy competing. Do you think in high school there’s the same competition, but on an intellectual level? Like ‘I found the answer first,’ or ‘I scored higher in the area we all care about?’

TG: Oh yeah. I’m sure there is. When I was in school I felt like I was academically quite competitive. I always wanted to know where I stood in the class (laughs). But there is a downside to that: there are some kids who are not competitive. They just want to learn, and don’t know how to balance that out as a teacher. That’s where the skill of teaching comes in, is being able to read the personalities in the classroom.

FT: And then you have those students who aren’t motivated by anything.

TG: Sure, and I don’t know what you do with those, I hon-estly don’t. That’s a tough one.

FT: In my classroom you had to take the student as an indi-vidual, as a person, and figure out how do I relate this to their lives? And then you take an interest in them as a person, and you show them you’re not going to take a default setting of failure. You know they can do it.

TG: And that is important, that failure is not the default setting. I think teachers have a difficult job today, certainly because so many kids come from households that aren’t that encouraging, or households that are chaotic. And to work around that? It’s still true that the primary determinant of a child’s success is still going to be their household. And all you
can do as a teacher is work with that.

FT: And sometimes you’re the best part of their day.

TG: That’s right.

FT: Now, you began writing when you went on maternity leave. And you’ve never looked back?

TG: There was a lot of fear there because I’d finished my medical degree, and I’d finished my residency, and now I was about to throw it all away to do something that very few people can earn a living at. There were a couple things in my favor. One was that I had a working husband. The other was that I had an excuse I felt was valid. I had two little kids at home. And the fact that my children needed care, and it was too difficult for two doctors to be raising kids at the same time made it easier for me to say, ‘I’m staying home.’ I have to give credit to my spouse because if I didn’t have another person earning income I would not have been able to do it, or I would have written a lot more slowly.

FT: How long was it after you began writing that you gave up medicine completely?

TG: About seven years, I was working part time. After my kids got into preschool I went back to work as a doctor about four hours a day. But then I still had free time; I still had a chance to write a page a day. That’s all it takes and in a year you have a first draft of an entire book if you are consistent and you don’t give up.

FT: I believe your first books were romances, then medical mysteries, and now you’re in crime/thriller, and all of your books had a dead body, right?

TG: That’s right, even the romances.

FT: So, why do you think audiences, be it Joe Public or students or TV watchers, love a mystery that involves a dead body?

TG: We love books that have very strong emotions. And there’s something about a mystery, a murder mystery that brings every single little emotion into it. It’s not only fear, but it’s grief and it’s thrills, and there is a sense of justice at the end. That’s why these stories have been exciting to people since the beginning of time. That and romances are the two most powerful tales that are told again and again and again. And nowadays crime novels have become popular. There are so many kinds of crime novels. There are forensic crime novels, there are historical crime novels, and there are paranormal crime novels. There’s just no end to the differences.

FT: And speaking of very strong emotions I wonder how much of that adds to the competitive nature of adolescence to make forensic classes so popular these days.

TG: Well, I think that adolescents are interested in it because of television. It’s sort of a CSI effect. People see actors they admire playing these incredibly beautiful and gorgeous forensic scientists on TV running around in low-cut blouses and think, ‘Wow, I want to be her.’ (Laughs). And it’s without understanding that this is a glamorized version a criminalist would look like. It really is the Hollywood effect. I think that’s the reason there’s so many people now interested in police work, because we have all these Hollywood cops running around. So, that is a large part of it.

FT: One of the first television shows I remember was a show on in the ’70s. It was very, very different from all the other shows at that time because it addressed a subject nobody seemed to want to touch. I’m sure you remember Quincy.

TG: I remember Quincy; he was funny (laughs). Honestly, I’m surprised it took so long for a character like Quincy to show up. I guess it may have been the taste issue—autopsies—I’m not sure America was ready for it. But then Quincy came on and then Patricia Cornwell opened the doors to medical examiners’ offices on the page. We didn’t realize how bloodthirsty American readers were; people just lap this stuff up. I am astonished at how much graphic stuff the audience wants. My stuff is not pleasant, there’s a lot of gruesome stuff in it even though I don’t throw much violence in there. And I find my number one fans are older women. They love it and sometimes they say, ‘We want it even more graphic,’ and I’m surprised.

FT: Oh, my. I bet you never saw that coming.

TG: No, I didn’t. I didn’t know it was the older ladies who liked this so much. I find that men seem to have a weaker stomach.

FT: Really!
TG: Yeah. It is surprising. It seems the primary readers of crime fiction are women.

FT: I wonder if the female angle for eating up television and literary fiction goes back to the strong emotions you mentioned.

TG: It could be. I think women read and are entertained by things that pluck our emotions. I think men are much more interested in the technical aspects of it. When you look at someone like Tom Clancy and his books, men like to read that because of the military details. They like the guns and the bombs and the things. Women really want to know how are people feeling about all this (laughs).

FT: Well, nothing makes us care about a character so much as a sympathetic face. Tell me about when you were contacted about taking your characters, Rizzoli and Isles, to Hollywood.

TG: It started with a producer who contacted me three years ago. I wasn’t too excited because I’ve signed a number of option contracts or outright sales to Hollywood over the course of my career. Nothing has ever happened with them. They pay me and nothing happens. This producer was a little different. He paid me and told me, ‘I know this is going to happen. I’m going to work at this until it happens.’ A year later he renewed the option, which is quite unusual, he hired a screenwriter named Janet Tamaro who was a former crime reporter, and who became an executive producer and wrote the pilot episode, and she’s the head writer. TNT like the script so much they ordered the pilot and hired Angie Harmon to play Jane Rizzoli, which was quite surprising to me because Angie Harmon is so gorgeous, and Jane Rizzoli is described as being a plain Jane. Then they hired Sasha Alexander to play Moira Isles, again a surprise because they’ve written her to be an open, friendly, blond, funny personality. And in the books she’s dark and gloomy and full of angst. So that didn’t match either. But I think when they tested these two actors together they had great chemistry.

I went out to watch the filming of the pilot, and that was really fascinating to see how many people are involved in the making of a television show.

FT: How long does it take to make a one-hour show?

TG: It took them about two and a half weeks of filming. And it’s hard work because they worked long hours. There were some nights where they were filming until 3 AM. And these actors must be exhausted by the end of the day. So, it’s hard work, it involves huge numbers of people, and tons of little details you don’t even think about. This is what surprised me.

One scene they filmed was supposed to be in autumn in Boston, but they filmed it in a suburb of Los Angeles. And the house they had rented for the set had blooming roses in front of it, so they went through and cut all the blossoms off the roses because it had to look like fall in Boston.

FT: What did they do about the turning leaves?

TG: You know what they did? They brought in bunches of plastic autumn foliage. And they stuck it into the bushes.

FT: Wait. We couldn’t move the shoot to somewhere where the leaves were turning?

TG: No, because they were going to shoot in Los Angeles, and it was really funny because this property had palm trees on it, so I don’t know whether they digitally excised those or they kept them out of the shot or what. There were so many things they had to think about, and I had to admire how much attention they paid to the details. But some things they couldn’t handle. These stars aren’t Bostonians so they couldn’t have the accent correct, and they eventually just gave up trying to have them do an accent because a bad accent is worse than no accent. They realized people could hear it was fake.

FT: That’s too funny. So, now, when millions of people pick up your books they’re going to picture Angie Harmon and Sasha Alexander.

TG: Right. (Laughs). But what we have are parallel universes. We have the book Jane and Moira, and we have the TV Jane and Moira, and I hope people are okay with being able to juggle both.

Tess (Continued on page 35)
Looking for Blood in All the Right Places

Your guide to finding hidden bloodstains

By Jeanette Hencken

For the average CSI-obsessed adolescent, blood is the ultimate evidence of a crime. Many of our students don’t think a crime scene is complete without a pint or two of the red stuff splashed around. Forensic scientists have learned how to type it, isolate DNA from it, and, best yet, make it glow in the dark. Integrating blood analysis into your curriculum is a vital part of planning a forensics course.

Blood is certainly evidence that you would want to look for at a crime scene. Unfortunately, it is not always as easy to detect as you might want it to be. Some criminals watch shows like “CSI” and “Bones” to learn how science is being used to find evidence at crime scenes. One common way to attempt to rid the scene of evidence is to clean up a scene after the crime has been committed, including the presence of blood. However, even cleaning up a scene is not always a successful way to remove all traces of a crime. Thankfully, Hollywood usually gets enough of the details wrong that dishonest viewers miss crucial steps.

There are a number of ways to detect the presence of blood even at a scene that looks pristine. For this article I am limiting the discussion to UV lighting, Luminol spray, the Kastle-Meyer test, and fluorescein. Each is able to chemically detect the presence of minute amounts of blood on a surface.

A portable UV-light is good way to visualize blood at a scene as long as the blood is not too dilute. A thorough washing of the area will remove enough blood to prevent any detection with just UV. Luminol and fluorescein are used to cause an area that is suspected to have blood on it to luminesce or fluoresce in a darkened room. Reduced phenolphthalein (Kastle-Meyer) will detect blood in a room with normal lighting. Commonly, Kastle-Meyer (KM) is
used to answer the question “could this be blood?” It is a presumptive test, not a confirmatory one. Luminol and fluorescein are used to presumptively determine the patterns of blood placement and removal of the blood. It is a very good educational experience for students of forensic science to see any of these detection methods in action. They certainly do not work as illustrated on TV!

In my introductory semester course called Forensic Science I refresh my students’ memories of blood information. My students then participate in a demonstration of blood visualization with Luminol in a small storeroom than I am able to considerably darken. After this we learn about blood spatter pattern analysis and they participate in three labs in which they use stage blood to experiment with the behavior of simulated blood to answer questions about what can be deduced from patterns in blood.

I also teach a second semester course for more committed students called Advanced Forensic Science. In this semester I do a more in depth covering of blood visualization. If you are teaching a year long course you could put all of this information into one unit. We then spend most of a class period experiencing the detection of blood using Kastle-Meyer, Luminol, and leucocrystal violet, which is a stain for protein. You can do this as a whole class demonstration or as a lab.

As a whole class demonstration I set up a room I can darken that has objects in it that have had blood on them. Using blood drained from fresh hamburger meat (I buy it from the store, drain it, and take it into school where I can refrigerate it to be used a day or two later). I dip my fingertips or another object in the blood and touch them to a disposable cup or a one foot square frosting tile or some other object easy to find and dispose of. You can either allow the blood to dry — it will need a few hours in a room with a noticeable airflow (a fan can provide this) or wash the blood off of the surface. The objects that can be washed are great to use to show that blood can be detected even after the surface has been cleaned.

I have learned it is better to provide your own new surface to test for the presence of blood than to be surprised by results. The first year I did a similar experiment I took my students into the hall where I had set up a crime scene. I liberally sprayed the area I had placed blood on with reagents and not only did my staged blood show up, the cleaned up, unseen, blood from a student accident from long ago also showed up.

It has been my experience that the results you get are not like on TV. However, they are still quite noticeable and interesting. So far my students still seem to be quite interested in the results when they experience them.

A few technical notes.

Reduced phenolphthalein (KM) and fluorescein are prepared essentially the same way. Both fluorescein and phenolphthalein are reduced by boiling them in a reflux apparatus in the presence of zinc and potassium hydroxide in order to remove electrons from the molecule, although formulas vary. Fluorescin, the reduced form of fluorescein, will react with the oxygen released from hydrogen peroxide (H₂O₂) when it is placed on hemoglobin. The fluorescin reaction results in a greenish-yellow light being given off where the reaction occurs; i.e., where the blood is.

Fluorescein under UV light. Click on image for video

Phenolphthalein, the reduced form of phenolphthalein, will react with the same free radical form of oxygen formed when peroxide is placed on the hemoglobin, by turning bright pink.

Luminol and LCV have similar preparation. Luminol solution is made by adding Luminol to a solution containing sodium hydroxide, then hydrogen peroxide is added to the luminol solution, although, again, formulas vary. After darkening the area (close out as much light as you possibly can) this solution is then sprayed on an area suspected to contain blood. If blood is present it will luminesce a bluish-white color. It has not been the experience of this author that the Luminol is nearly as bright as that shown in movies or television programs. LCV solution is produced by dissolving 5-sulfosalicylic acid in distilled water, then adding this solution to hydrogen peroxide. Finally the LCV is added to the solution. When the LCV is sprayed on a carpet surface that contains bloody footprints, a nice contrasting purple print is developed as the LCV binds to proteins there. LCV is recommended for use in most cases as a wash and only as a spray on carpet.

In order to record the information obtained by using Luminol or fluorescein, cameras must be set-up prior to spraying the area. There are a number of other issues that need to be taken into account when using any of these preliminary tests. All should be tested with a negative control: an area expected to be free of blood. All should also be tested with a positive control: a sample known to contain blood. False
Kastle-Meyer Reagent

Kastle-Meyer is the name of a test that can be used to preliminarily identify a substance as blood. Because it is a preliminary identification, this type of test is called a presumptive test. When this test is done on a sample, a second test must be done to determine if it is indeed blood. That test is usually done by examining the presumed blood under a microscope. There are two tests that are most frequently used: the Teichmann test and the Takayam test. Both are microcrystalline tests. That is, the test results should yield a specific crystal formation if the sample is positively blood. The Teichmann test works by heating dried blood in the presence of glacial acetic acid and a halide to form a hematine halide if blood is present. The Takayam test heats blood at a high pH in the presence of pyridine. A positive test result would yield crystals of hemachromogen (pyridine ferripotopophyrin). Some labs use a third step in testing the blood. They test to determine if the blood is human. This test is done by adding anti-human hemoglobin serum. When other animal hemoglobin is added to human hemoglobin a precipitate is formed. This test can be done by adding the drops of anti-human hemoglobin serum or by using a premade test device that will give immunochromatographic results. They give a result similar to a pregnancy test kit you can buy at the pharmacy: a colorful result if human blood was present. Forensic labs no longer use the blood type or enzymes tests. Many labs no longer use the human hemoglobin test to determine if the sample is human. According to more than one DNA expert I have consulted, since they are already running so many DNA tests it is more efficient to simply run the sample through DNA testing. This test will eliminate those samples that were not human.

Making the Kastle-Meyer Reagent: Phenolphthalein.

Materials
Phenolphthalein, 1.0 grams
Deionized water, 50 mls (frequently sold in the laundry section of a store)
Potassium hydroxide, 10.0 grams
Granular zinc, 10 grams
Reflux apparatus (round bottom flask, condenser, two hoses, two clamps, a water source and sink)
Ring stand
Fluorescein Reagent: Fluorescin

Materials
Fluorescein, 0.2 grams
Deionized water, 20 mls (frequently sold in the laundry section of a store)
Sodium hydroxide, 2.0 grams

Procedure:
1. Place fluorescein in a container and add deionized water.
2. Stir until the fluorescein is dissolved.
3. Add sodium hydroxide to the solution until it becomes clear.
4. Store the solution in a refrigerator to keep it stable.

Suggested Demonstration

In order to prepare for this demonstration you should purchase a package of ground beef and drain off the blood. The blood can be stored in the refrigerator for two to three days or frozen until needed. Choose a surface on which to smear the blood. (A patterned stain hat can be visualized when illuminated is much more impressive to the students! You can do this by dipping the bottom of some object into the blood. Then press that object onto the surface to be sprayed. A shoe works well for this.) A square of tile works great as the surface to be sprayed and can be purchased inexpensively, fifty cents a piece, at a warehouse-type hardware store. Allow to sit for an hour, to dry on the surface. Wash or rinse the surface off so that no blood can be seen.

When ready to show this demonstration, take the luminol, the cleaned surface and the students into an area that can be darkened - the darker the better! Spray the surface with luminol or dip the object in the solution. It should be immediately visible.
To set the stage as an Environmental Conservation Officer (ECO), we have to begin in the year 1880 in the state of New York. In the late 1800s New York State (NYS) did not have any regulations pertaining to the hunting and fishing laws for its citizens. The taking of wildlife, such as the timber wolf for example, decimated their numbers to the point they became extinct. In order to achieve much-needed regulations, Alonzo B. Cornell, NYS Governor at the time, established the formation of the first eight, “Game Protectors.” Theodore Roosevelt, as a later governor of New York State, was greatly instrumental in the expansion of our first Game Protectors. President Theodore Roosevelt was passionate in his involvement with the movement for conservation. He was instrumental in our country’s expansion in the declaring of new national forests in the western United States. Mr. Roosevelt sought lands for public use. In 1964, the title Game Protector was changed to Conservation Officer; in 1970 it was changed to Environmental Conservation Officer (ECO).

Our law enforcement division has been on the cutting edge implementing modern training methods and new crime scene techniques. One way our division has improved is in the way we developed and implemented crime scene investigation techniques in our hunting related shooting incidences (HRSI). The old way to investigate a hunter related shooting incident was to call it a hunting accident. The division realized these hunting accidents could cross the threshold into a penal law crime. The new terminology is a hunter related shooting incident (HRSI). Much of the credit for our new investigation techniques is credited to my current captain, Michael Van Durme. Captain Van Durme started out as an ECO and was promoted to an Environmental Crime Investigator Lieutenant. As he remembered some of his past hunter shooting incidences, he realized the need for newer techniques to be used in the field to document and reconstruct our hunting crime scenes. He contacted other states to see how their wildlife officers investigated their hunting accidents. He developed special crime scene techniques, and put them into a field packet of forms to be used for investigating any hunting incident in NYS. The packet is a thorough investigative tool and it covers all of the bases to successfully recreate the incident, and include all of the necessary information for a satisfactory investigative conclusion. By giving the officers the correct training, along with the HRSI packet, successful conclusions began to be completed in the field. In the early 1990s several Mid-Western states, Wisconsin, Iowa, and Missouri were developing and teaching forensic techniques for investigating these scenes. Captain Van Durme attended this training and brought the techniques back to New York. Mike also invented the Measurement of Visibility Device to better document what the shooter would have seen while in the woods. Officers who undertake the use of modern crime scene techniques are some of the most successful officers. They are constantly adding to their levels of crime scene knowledge. These officers are the ones who look for new and sometimes exciting breakthroughs into the world of crime scene techniques.

I am currently an Adjunct Professor at the Finger Lakes Community College in Canandaigua, New York. I conducted mock crime scenes for the past six years in order to show the students some of the types of cases we investigate. I am assisted in these mock scenes by outside agencies including Ontario County Sheriff’s Department deputies who are also certified crime scene technicians to assist me in the scenes. The scenes were made up to include environmental crimes as well as penal law crimes. The new class I developed is called “Wildlife Crime Scene Investigation (WSCSI),” and is based on the procedures to collect environmental crime scene evidence. The types of evidence one might encounter out in the field is varied. The class has an emphasis on developing and teaching forensic techniques for investigating these scenes.
students using some of the basic crime scene tools, with emphasis being on wildlife crime scenes. Instruction to students explains the wide range of techniques that might be used by an ECO in our crime scenes. As a crime scene technician, you have to draw references from old closed cases and then use these same cases to relate it into the classroom setting.

I will begin with my most recent crime scene case, the illegal taking of a bear in Naples, New York. The most profound issues we face are sometimes the covering up of illegally taken wildlife. Some of the hunters we encounter have utilized the standard practices to cover up this type of wildlife crime. However not all hunters do so, and most are the quiet keepers of our wildlife and forests.

It was the third day of deer season in Western New York and I received information regarding a black bear that was shot and killed. The bear season was not open for another week in that part of New York. My information placed the killing of the bear, close to the borders between Ontario and Livingston Counties.

I received information from our dispatch center of a name of a person who witnessed the bear being illegally taken. The witness came forward after they realized bear season was closed. I made contact with the source and I gathered information on what the witness observed. In the beginning of my investigation, I learned this black bear was a very rare one and it was called a Cinnamon phase bear. This animal is a black bear who was born in the red hair phase and the color could be described as a golden retriever red.

The bear was taken from a roadside ditch and my witness showed this location to me. I went to the site where the bear was last observed running after it was shot. We both went to the path of the bear and we came across fresh disturbance of leaves and broken branches. These signs of where the bear ran corroborated the witness’s account of the bear running through the woods.

I needed to document the bear’s path after it was shot and recounted being able see the bear running through the woods. We went back and I documented the witness’s story on where the bear ran. The tracks showed claw marks and broken branches.

The dead bear was taken away by the hunters who used their ATV to move the body. The bear was field dressed in the roadside ditch. This means all internal organs were removed and dumped on the ground. I took samples for DNA analysis if I needed to match the carcass to the entrails when and if we found the body.

As a crime scene technician, you have to lay the groundwork in the beginning of any investigation. You gather the facts as quickly as you can to determine the who, what, when, and where something
Forensics in Another Light

By Ann Kosloski

On TV, at the movies, and in crime novels the protagonist is usually one step behind the bad guy up until the end when everything hangs on solving a puzzle. This could be the killer’s real name, the location of the victim, or some information that will let the good guys get where they need to be just in the nick of time. It’s a formula that has kept us riveted for over a century of popular mysteries. But what if such a scenario occurred in real life? It did, and the killer was just a little more on the ball than the law. People died again and again. The killer was never caught. And today he remains an aging mystery who could still be out there.

Welcome to the world of the Zodiac.

The Zodiac Killer sent letters to the newspapers of San Francisco, but they were in code. It was a simple code, but one the authorities couldn’t wrap their minds around. It took two patient school teachers a morning to crack the cipher, and when they did the world knew it was dealing with a level of psychotic evil to rival Charles Manson. Granted, deciphering the messages sooner might not have led to an arrest, but it would have let police into the twisted mind of this man. In the days before behavior profiling every clue was vital.

The Zodiac used a cryptogram to write his letters. This is a code made by substituting one letter for another. The letters the newspapers received used symbols substituted for letters, but the theory was the same. Most daily newspapers carry cryptograms near the crossword and Sudoku puzzles, and millions of readers love to try their hand. During the murders they were rare enough that most people hadn’t seen them when the Zodiac was using them, and this definitely hindered the police.

Part of using forensics is using your mind, especially if you have to push yourself out of your comfort zone. Cryptograms fit the bill perfectly, particularly if your students like “Wheel of Fortune.” Before asking your students to tackle a cryptogram from the Zodiac, guide them through a regular one.

Most of the effort in solving a cryptogram is trial and error, with a number of helpful rules:

1. Look for single letter words. These are usually I or A. Since many cryptograms are quotes the letter I will usually be found at the beginning of a sentence. In a two letter word one letter will be a vowel.
2. Find the most frequently used letter. In English they are E, T, A, O, I, N, S, R, H, and L, in that order.
3. Observe punctuation. If a sentence ends with a question mark the first word is probably WHO, WHAT, WHERE, WHEN, WHY, or HOW. Also, an apostrophe is usually followed by a T, a D, or an S (as in CAN’T, I’D, or IT’S). Also, AND and BUT often follow a comma.
4. A frequent three-letter word is THE.
5. Try to identify the vowels. Most double vowels are usually E or O unless the message is about skiing or vacuuming. A double consonant can be SS.
6. Frequent consonant pairs are TH, WH, SH, or CH.

An example of a cryptogram is the following:

“OH’P YSH HLBH O’Z BCKBOF HS FOA. O NDPH FSY’H RBYH HS IA HLAKA RLAY OH LBMMAYP.” —RSSFE BQQAY

Remember, each letter represents another in this example. If we apply both the rules mentioned above, and ourselves the answer becomes clear. It can be found on the next page. Please resist the urge to cheat.

Now for the Zodiac messages. He used symbols instead of words, but your students might be able to figure them out if they concentrate. Make sure they don’t take this exercise home with them because the Internet is full of pages about this cipher.

The Zodiac message isn’t easy, but the process of solving cryptograms is good for the brain. Consider giving your students more from your daily paper, or make your own.
On July 31, 1969 the Zodiac mailed a different third of a cipher to three San Francisco newspapers and demanded the newspapers print them on their front pages. Readers of all three papers would have the complete message. He threatened to kill more people if they did not comply. All three printed the ciphers. He promised the ciphers contained his identity. The police were stumped, but Donald and Bettya Harden, a pair of teachers, cracked the code a week later. The Zodiac lied about his identity.

This cipher is different from normal cryptograms because not every symbol had only one corresponding letter. See if your students can crack it. If you want the rest of the message do a Google search for Zodiac and 408, the number of characters in it.

STUDENT’S VERSION

![Student's Version Image]

TEACHER’S VERSION

![Teacher's Version Image]

“I like killing people because it is so much fun. It is more fun than killing wild game in the forest because man is the most dangerous animal of all To kill something gi...” The message was continued in the two thirds of the puzzle.

Cryptogram Answer: “IT’S NOT THAT I’M AFRAID TO DIE
I JUST DON’T WANT TO BE THERE WHEN IT HAPPENS.” — WOODY ALLEN
On top of a rolling hillside overlooking the Tennessee River and the University of Tennessee-Knoxville campus lies a unique research facility commonly known as The Body Farm. Its official proper name is The Anthropology Research Facility (ARF; http://web.utk.edu/~fac/) but the students and faculty of the UT anthropology department just call it “The Facility”. No matter what you call it, there is always a curiosity and some mythology surrounding this topic. Below are a few of the more common misconceptions about The Body Farm.

1. **You can arrange a tour of the facility.** No. This is a true research facility and only authorized personnel are allowed. Researchers, faculty, and students conduct research projects at the facility. There are a number of short summer courses that are offered to law enforcement, educators, and students that take place on the UTK campus and include some activities in the facility.

2. **The bodies used for research are unclaimed or donated individuals.** Originally some of the bodies were unclaimed deceased individuals but now almost all of the bodies are pre-registered donations. Many people who choose to donate their bodies to science specify the ARF. Rarely do surviving family members make the donation. If the individual died within the local Knoxville area the ARF will even pick up the body, otherwise it is the responsibility of the surviving family to arrange transportation. No donation is accepted if the individual had MRSA, Hepatitis, or TB; the risk of infection from those diseases is just too great. On the other hand, embalming a body, while they prefer you don’t, does not preclude it from donation.

3. **All bodies are used for research.** Actually, no. It depends upon the research needs at the time. If a body meets the criteria for a particular study it may be used. Otherwise it is taken to the facility and set out to decompose. Once the skeleton is defleshed the bones are cleaned, measured, and added to the main collection, housed in the storage area under Neyland Stadium. All of the skeletons are measured and those measurements are entered into a database, which is used to provide statistical information of modern humans. Most of the biometric measures were developed from human remains that were 100 or more years old. Height calculations and ancestry are two of the characteristics that have changed in recent years and need to be reformulated.

4. **It really stinks out there.** Well, yes, a bit. Some bodies are exposed to the open air, but most of the bodies are either buried or covered with a plastic sheet. Some of the studies, such as a animal/carnivore activity on a body, require an exposed cadaver. Some of the bodies are buried to provide an opportunity for the summer students to learn how to properly recover a buried body. Most of the individuals, however, are laid out to decompose and expose the skeleton for the main collection. Those individuals are placed on the ground face down (to allow the small bones, such as the hyoid, to fall directly to the ground) and covered with a plastic sheet. The sheet does not seem to delay decomposition, nor retard the putrefaction odor. Remember, though it is an outdoor, open area facility and all one really has to do is move upwind if the odor is unpleasant. Nonetheless, the bodies are often at the facility for a year or a bit longer but the odor is only strong for a very short time.

5. **There are only a couple of bodies (or hundreds of bodies) at the Body Farm at one time.** At one time there are only about 160-180 bodies residing at the research facility. Some of those are there for a short-term research project, a few weeks or so. Others are there for longer, a year or more, to de-flesh and join the collection. A very, very few are there for longer periods, maybe 10 years, to follow the changes in the remains over extended time.

6. **The remains are returned to the family once the research is finished.** No, the bodies remain in the possession of the UT Anthropology Department as part of the William M. Bass Donated Collection and provide the basis for much of the modern research on height, sex, ancestry, and age. However, family
members may come to the facility and visit their loved one if they wish.

7. All of the experiments are on humans. Although humans are the main focus of the research there have been studies on insects, animals, environmental, and chemical factors that may advance the knowledge base of the process of the decomposition.

8. The UT facility is the only one of its kind. Well, it is the oldest of its kind (since 1981), but not the only one. The University of Texas has two sites and Western Carolina University has one.

9. The only research is about decomposition. Although the original purpose for the ARF was to study time since death and the decomposition process, many other studies have been done that contribute to greater understanding of anthropology, human death, and crime scene evidence. The facility provides a major source of modern anthropological specimens.

10. There is no type of forensic training that is not done at the facility. Actually, almost any type of forensic training can be considered for the facility except cadaver dog exercises. There are just too many bodies out there and the dogs simply cannot focus on a single training exercise.
happened. You collect the evidence in a methodical collection pattern, and document your findings. In order to know what the evidence is, you rely on past experiences and the experiences of fellow officers. You must gather all the evidence as soon as possible. This evidence collection must be documented in several ways. The first is to photograph the site. Then, gather the scene’s evidence and then use this information to set up the investigation’s direction. The evidence will dictate the way questions will be asked during the interview process.

The bear’s carcass location was unknown, but after interviewing a member of the hunting party details were let out of the bag. The suspected poacher claimed the bear was taken with bow and arrow. He said the bear was taken to a taxidermist who I have talked to in the past. When I arrived I needed to see the bear, but I was out of luck; it had been skinned and salted. This last step preserves the skin for mounting. The actual carcass was not there.

The entrance wound was in its original condition as it was when the bear was brought in. In order to glean information from the wounds, I had to determine how the bear was shot. The wound was not a symmetrical cut as it is when an arrow goes through the flesh. It appeared the hole was from a shotgun sabot round (a large slug as opposed to the load of buckshot ammunition normally fired by a shotgun) that tore into the skin. The hunters tried to recreate an arrow hit by doctoring the entrance wound, but the cuts were not symmetrical.

I wanted to use our lead presence test kit used by my department. The information on the tag indicated the bear was taken with an arrow. As I stated before, evidence collected at the scene and the statements from the witness clearly showed the bear was shot with a gun and not by an arrow. I performed a lead test on the bear’s entrance hole. To determine the presence of lead, you first remove the hair from around the wound. I used a lead test swab/dauber, and in order to test the area around the entrance hole you have to break the vial inside the test dauber. The liquid will combine inside the dauber’s tube, and you gently rub the tip of the dauber on the edges of the entrance hole. If there is a presence of lead, the cotton tip on the dauber will turn red/pink.
depending of the lead concentration. As you can see from the photo, the test showed the presence of lead. I also performed a test confirmation to verify the test I performed. I applied the liquid from the dauber to a paper test circle and watched if the inside of this circle turned red, and it did.

It is as important to take photos to document what the entrance hole looked like before testing and examination, as it is to document any damage to your evidence. The entrance and exit holes will determine the possible locations of the shooters. You can also determine who hit the animal from the wounds by examining bullet trajectories. The presences of lead supported the witness’s hearing four shotgun shots before he saw the bear running.

The skin cape did not have an exit wound. I discovered the bullet had made a bruise directly across from where the bullet entered the bear on the skin, which indicated the bear was alive when it was shot. Notice the bruise and the light color in the center where the bullet hit the skin in the photograph. This bullet did enter the side of the bear but the bullet did not exit. Based on the detection of lead and the entrance hole showing the uneven cuts, it was clear the bear was not shot with an arrow. The next job was to find the bear’s meat and carcass. I tracked down the carcass by asking the taxidermist where it went. He told me of another man who wanted the meat. I found him and found the skeleton and some of the meat in the man’s garbage.

I performed an inspection and confirmed where the bullet entered the bear. Looking at the spine I found a piece of the bullet and it appeared to be the tip of a sabot bullet.

All of the evidence was secured and placed in the evidence intake locker at my regional office. The back bone evidence was also hermetically sealed by our DEC Wildlife Tech, Ron Newell, and the evidence was placed in our freezer.

The arrest of the hunting party members took place next. Because of their earlier statement about taking the bear using archery weapons we knew who they were. When their lawyer was presented with our evidence, witness statements, and test results, they plead guilty via signed confessions to illegally taking the bear, and to two misdemeanors for forgery and false reporting of business records. Because they changed the original bear’s carcass tag, and reported the bear with false information they were substantially fined. They also found themselves unable to obtain hunting licenses for the next few years.

This case should have been completed within a week after we learned of the bear taking. However, as in many crimes committed by some people, they will take the wrong path to cover up their actions, which draws out the investigation. In wildlife crime scenes we have to gather the evidence, pursue the truth, and bring the violators to justice. This case was time consuming, but in the end the proper documentation of evidence, interviews, and field testing proved the facts of the case without a doubt. I want to acknowledge the several hunters who witnessed the taking of the bear. Their cooperation in this case was a vital component. In my profession, we have to depend on the hunters to report and lend a hand, and they have to stand up for the hunting heritage we all enjoy. Their information sometimes provides the much-needed part to solve our crime scenes. The hunting public is at times our eyes and ears for information.
Although different laboratories have different protocols to follow in their specific examination, generally the specimens will be compared using lighting and magnification to distinguish fine detail. Some of these properties are the type of paper, dimensions, color, spacing of components (e.g., space between lines, punch holes in paper, perforations, etc.).

First, the students will separate the numerous pieces of material to be reassembled based on the physical/class characteristics such as color or paper, fluorescence properties, color of any writing or printing on the document, orientation of any writing or extrusion marks on the material. Each student or pair should be given a bag containing a single, one-page, shredded document. After the class becomes familiar with the protocol they can try their hand with a bag containing two different documents. A key to getting started is to remember that shreds from the same document tend to stay near each other.

The students should separate and group similar materials. They should visually examine the specimen(s) for identifying characteristics along the torn, cut, or shredded edges. Align the pieces of material having visually similar edge characteristics. In most cases these are likely to be identical if from the same, unmodified shredder.

Then the teams should do a side by side comparison of the specimen(s) to evaluate the edges for fracture pattern consistencies, paper fiber crossings, text crossings, or any other characteristics to determine if the specimens were one time attached. They can use magnification or lighting as necessary.

They can then place shredded pieces on the two sided tack paper to assemble. Depending on the fragility of the paper, forceps may have to be used to place the paper on the tack paper. Using the above characteristics as a guide, they should assemble the shredded pieces to form legible words or phrases, addresses, or company logos. Looking and reading the text on a specific line of a strand of paper can help students predict what will be on the next, correct strand. In addition, students should keep in mind that a document doesn’t have to be completely reconstructed if all the text on it has been identified. Many offices use forms for information to be later shredded. Having a blank form to compare the shreds to is like having a roadmap for reconstruction.

In the real world other types of garbage are mixed with shredded paper. If your students want realism mix in some coffee grounds or shredded papers that clearly don’t belong such as envelopes, cancelled checks, or labels.

Following the reconstruction, the specimen in its final form should be photographed, photocopied, or scanned. This is facilitated by placing a clear overhead projector sheet over the reconstructed document.

If you have students who give up before they’ve started because they’ve convinced themselves the job of reconstruction is impossible, you can give them a training version: a shredded document with a picture on it (a photocopied, enlarged dollar bill for example), or one with only a couple sentences. After such an exercise raises their confidence you can give them more realistic examples.

Students who enjoy puzzles will enjoy this exercise. If you use a columnar shredder, try using paper of different colors or weights when you do more than one document at the same time. The reconstruction of shredded documents is a lab some students will balk at because they see it as an exercise in futility. As they work, however, they will see things come together in a way that will boost their confidence and experience.
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If you like our magazine find us there and you’ll get updates, all the latest developments, and not have to worry about your spam filter keeping us from reaching you with our emails.
Whenever you watch CSI, Bones or NCIS, aren’t you looking for gross, bloody, or oozing evidence left behind from the criminal? Of course you are and that’s why people watch those shows. Some physical evidence a criminal leaves behind makes it easy for the crime scene investigator or detective to conclude who committed the crime. But, what if that evidence wasn’t so easy to detect?

As we know, evidence of a crime takes many forms. It can be fingerprints, trace evidence, or DNA. Some of the most condemning evidence can be the documents that describe the crime, provide information of the illegal operation, or diagram that shows the components to an explosive.

Document examinations are used to determine the authenticity of a document using class and individual characteristics. The examinations can include, but are not limited to handwriting analysis, paper typing, examinations of burned or charred documents, evidence of invisible ink, or even shredded document reconstruction.

Documents can provide a solid case in court regarding the person’s knowledge of the crime or the amount of his involvement in the crime. Documents such as these have provided crucial evidence in criminal trials. Examples include Theodore Kaczynski (confessed Unabomber) through his own written manifesto; Bruno Richard Hauptmann who was convicted of the Charles A. Lindbergh Jr. kidnapping through handwriting analysis; and former FBI Agent Robert Hanssen who passed highly sensitive information to his Soviet and Russian handlers in exchange for large sums of cash and other compensation. The information he provided compromised FBI and U.S. intelligence operations, techniques, sources, and methods, and earned him life in prison. Obtained documents were examined for handwriting comparison, indented writing, and other unusual features.

Unfortunately the documents do not come in a nice, sorted, bound condition. Condemning documents could be at the bottom of a trash can, under the spaghetti sauce and egg shells, or stored in the wheel well of a car, so the police don’t find it executing a search warrant. Some criminals even try and put the paper through a paper shredder to destroy it. (An 8 ½ by 11 cross-cut page contains approximately 400-600 fragments).

Evidence submissions like this can come in 33 gallon garbage bags taken from a bookmaker running an illegal sports betting ring or a drug dealer or even major corporations...
such as Enron to destroy evidence of their corruption.

Luckily, there are people in laboratories across the country that manage to examine these documents in whatever form they come in. Professional training by crime laboratories provides the examiner the ability to put these torn or shredded pieces of paper together that make sense to the reader. Think of it like putting a puzzle together that makes a picture.

For all practical purposes, shredding documents provides security in an imperfect world. Major world companies, the Departments of Defense, and John Q. Citizen use document shredders to protect information that should not be thrown out with the trash. We hear everyday about the thousands of people who have had their identities stolen because they throw out their electric bill or Visa statement with Monday night’s trash.

Documents shredders provide an individual or a corporation with the feeling of security because documents can be torn, shredded in a columnar fashion and cross-cut with newly developed shredders that provide the ultimate in document disposal security.

In 1979 when Iranian revolutionaries took over the country from the Shah the new government hired local carpet weavers to help reconstruct shredded documents. These artisans were used to tying 400 knots per inch and the work went quickly. In response, the US government updated their document destroying repertoire to include pulping, pulverizing, and chemical decomposition.

Today computers can make quick work of reconstructing shredded documents, even those from cross-cut machines. One Houston firm developed a special process after the Enron scandal. They currently charge thousands of dollars per cubic foot of shreds, and thanks to law firms, they have more business than they can handle.

Questioned document examiners sometimes conduct edge examinations on shredded, torn, or cut paper, tape (paper and scotch tapes), postage stamps, or other document evidence materials to determine if two or more specimens were attached at one time.

Torn or otherwise obliterated documents also provide a window into the world of individuals or operations that do not operate legally. This provides a valuable learning tool for students.

In May, 2009, I traveled from the FBI, where I work, to the Chautauqua Erie II BOCES Explorer Program to conduct a training exercise with Dan Depitrio’s criminal justice students. The exercises had several components: first, a shredded document reconstruction of a threat letter to a major power company. The second part was a code breaking exercise using a simple substitution system on the reconstructed letter to decode the cipher, and last was an examination on a piece of physical evidence exercise involving the identification of the fingerprint to the suspect.

This article will concentrate on the manual reconstruction of the document.

To begin the reconstruction of a torn or shredded document, each student or pair will need:

- Machine shredded paper (columnar)
- Hand magnifier
- Two sided tack paper (3M®) and clear polyethylene film (Mylar®), or an equivalent.
- Scissors
- Forceps
- Rulers
- Tape
- Ultraviolet (UV) source or equivalent
- Protective gloves

(Continued on p. 26)
Granular zinc, 2.0 grams
Reflux apparatus (round bottom flask, condenser, two hoses and a water source and sink)
Ring stand
Clamp
Wire heating element or bunsen burner

Fluorescin is made by reducing fluorescein in the presence of zinc.

Procedure:
1. Set up the ring stand and clamp near a water source and gas source (and electrical if using heating element).
2. Place either the heating element or the clay triangle in the clamp. Connect Bunsen burner if not using heating element.
3. Place the fluorescein solution (0.2 grams of fluorescein in 20 mLs of dionized water and 2.0 grams of sodium hydroxide, NaOH), in a round bottom flask that can be heated and connected to a condenser.
4. Add 2.0 grams of granular zinc to the flask.
5. Place the flask on the ring stand in the heating element or on the clay triangle.
6. Clamp the condenser in place above the flask.
7. Connect the condenser to a water source at the bottom and into a sink at the top.
8. Run tap water through the condenser while heating the solution until the solution is clear. The heating process takes 2-3 hours. Dilute 5:1 with 95% ethanol. Stored in a refrigerator, this keeps well for a limited time (~ 6 months).

Leucocrystal Violet (LCV):

Materials
5-Sulfosalicylic acid, 5.0 grams
Distilled water, 50 mls
3% hydrogen peroxide, 200 mls
Leucocrystal violet, 0.75 grams
Flask, 250 ml
250 ml beaker
Glass stirring rod
Fine mist spray bottle

Procedure:
1. Place 5.0 grams of 5-Sulfosalicylic acid in a 250 mls flask.
2. Add 50 mls distilled water to the flask, stirring thoroughly.
3. Add 20 mls of leucocrystal violet to the bottle.
4. Add the peroxide mixture to the flask containing 5-Sulfosalicylic acid.
5. Mix solutions well.
6. Store the solution in the refrigerator to extend the life of the solution. Good for a year if kept cool and out of light.

To use
Transfer amount needed to a spray bottle. 10-20 mls at a time.

Suggested Demonstration
In order to prepare for this demonstration you should purchase a package of ground beef and drain off the blood. The blood can be stored in the refrigerator for two to three days or frozen until needed. Choose a surface on which to smear the blood. (A patterned stain that can be visualized when illuminated is much more impressive to the students! You can do this by dripping the bottom of some object into the blood. Then pressing that object onto the surface to be sprayed. A shoeworks well for this.) A square of tile works great as the surface to be sprayed and can be purchased inexpensively, fifty cents a piece, at a warehouse-type hardware store. Allow to sit for an hour, to dry on the surface. Wash or rinse the surface off so that no blood can be seen. When ready to show this demonstration, spray the surface with leucocrystal violet. It should be immediately visible.
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Trace Evidence

Across
3. The study of pollen
4. The first step of analyzing trace evidence
7. Wool is this type of fiber
8. Arson trace evidence
10. Evidence from follicles
11. A type of solidified liquid trace evidence
14. Glass's telltale index
17. Wayne Williams used this to wash off trace evidence
18. This has a medulla
20. Trace found on a shooter

Down
1. Trace evidence commonly gleaned from cars
2. Trace evidence from plants
5. One of the most common types of trace evidence
6. A long chain of molecules
9. The biggest danger to trace evidence
12. This is the father of trace evidence
13. Contains the color of a hair
15. Tire trace evidence
16. The size of the majority of trace evidence
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18. This has a medulla
20. Trace found on a shooter
21. The bottom of a hair
22. Microscope that uses aligned light
23. Rugs give these up
24. Nylon is this type of fiber
25. Trace from a bullet
26. Headlamp part that confirms it was on when examined
27. Trace left after auto accidents
28. Trace left after explosions

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16. The size of the majority of trace evidence
19. Two microscopes in one
23. Left behind by clothing
24. Trace often linked to trees

Solution

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Solution
Mini Mystery Solution (from page 6)

Murder at Big Jake’s
Since he was identified at the bar, Gummond’s first statement is false. Under either variation of the disorder, his second statement is therefore true. The content of that statement implies the truth of the fourth statement as well.

If Gummond were lying every third statement, his fourth statement (three after the false first statement) would be false, which it isn’t. Thus he is lying every other statement. Gummond’s third statement is therefore false, and he did the shooting.

Quiz Answers (from page 35)

1. False. Hair by itself does not contain nuclear DNA which is needed to link it to a person. If the hair is ripped out, the follicle at the root will contain nuclear DNA, but a piece of hair by itself won’t tell you who it came from.

2. True. As your body metabolizes the drugs some of it ends up in your hair. If you did cocaine or marijuana six months ago, and hair grows at the rate of half an inch per month, traces of the drugs will be detectible where your hair is three inches long.

3. False. Forensic scientists can tell a lot of things from a person’s hair, but the age of the person it came from is not one of them.

4. False. While the three anthropologically defined races of Man have their own readily identifiable hair medulla characteristics, interbreeding between the races clouds the matter. This answer is false because while a victim with a white mother and a black father will display hair medulla matching that of a Negroid, it will be impossible to tell the victim was half white, and the victim may be able to pass as white. Generally, it is safer to say that the appearance of a hair’s medulla is of use in excluding the other races.

5. False. While hair without a follicle will contain mitochondrial DNA, this type of DNA can only be used to trace the hair back to an individual descending from a particular maternal blood line, not to the individual himself.

6. True.
7. True.
8. False. Ten minutes after the heart stops every cell in the body is dead from lack of oxygen, including follicle cells. The reason exhumed individuals look like their hair and nails have grown is because the skin tightens up and accentuates the prominence of the hair and hails, especially beard stubble.

10. False. While many variants of papillomavirus have been found on the skin of dozens of species of animals, the hair analyzed by forensic laboratories generally comes from humans, and it is generally analyzed because it was separated from the individual who grew it. No universal precautions are necessary except for those necessary to prevent contamination of the sample.

Scoring (Number correct)

0-3: Whoops! Was this a quiz about hair? You must have thought it was about air! Either you’ve had yours bleached one time too many, or you simply drank the dye. You probably think a hair extension is a something Rapunzel threw down for her boyfriend.

4-7: You’re a little better than your clueless friends who did worse than if they’d just guessed at the answers, but you’ve still got a ways to go. Study, study hard and you might get more right next time the subject comes up. Then rinse and repeat.

8-10: Great! Maybe you’re a werewolf, or just have a lot of wigs at home, but no one pulls the wool over your eyes on this subject. You care about hair, if it’s bare it’s rare, don’t dare to pare, not fair to stare. Ai’ght?
Hair Quiz

Most people don’t know how many hairs they have on their head. These are the same people who don’t know how many hairs they lose daily. And they don’t even give a hoot that even whales have a few vestigial hairs. But what about the weaves some women wear along with their own locks? They can be real or synthetic, expensive or cheap (and cheap looking). Here’s a short quiz to find out what you know about hair.

By Roger Wilson

1. ________ True/False. Hair contains DNA which can be used to track it back to the person it came from.

2. ________ True/False. Hair absorbs illegal drugs and can be used for a drug test.

3. ________ True/False. The age of an individual can be determined from their hair.

4. ________ True/False. Race can be determined from a piece of hair.

5. ________ True/False. Hair contains mitochondrial DNA which can be traced back to an individual and used to identify them.

6. ________ True/False. The cortex of hair contains its color.

7. ________ True/False. The hair on your head grows at about half an inch per month.

8. ________ True/False. After you die your hair will grow an additional three millimeters until the follicle cells expire. Those cells need very little oxygen and nutrition and can live for up to a week after a person’s death.

9. ________ True/False. Under a microscope every species’ hair looks different, even if the species are closely related like ferrets and minks, or rats and gerbils.

10. ________ True/False. Universal precautions (gloves, mask, etc…) must be taken when performing detailed analyses of hair samples because of the possibility of contracting papillomaviruses.

Answers on page 34

Books (continued from p. 6)

that fool you. Each is a great resource loaded with experiments and content for any age forensic student. Or, if a teacher is new to the subject, they’ll get a lot out of these volumes. Even if a teacher is experienced these are great resources to have.

The books can be ordered from Freyscientific.com. The website is a little confusing so click on the Shop Our Store button, then enter the subject title of each book in the search box.

Reviewed by Enrico Pelazzo
What’s Going On?

Ask the Morgue Guy

Q. Sometimes I'll look through a forensics catalog or browse at a yard sale and find something really cool, like a misshapen skull or a scale like Lady Justice carries. I find myself wanting those things for my classroom, or, worse yet, my office at home. Is there something wrong with me for being interested in criminalistic memorabilia?

Sharon Anne Wallace, Canton, Missouri.

A. Not at all. Being interested in your subject is not only healthy, but it helps feed the passion within you. I hope you take some things from your collection into show your students. These things help lend credibility to your lessons and your crime scenes. Plus, many of your students are likely to appreciate them as well.

If you’re not too attached to some of your goodies, and your students are as engaged by them as you are, it’s possible you could have an end-of-year auction, either out loud or silent. Your students won’t bid on everything, there’s no pressure to bid, and you have a great opportunity to raise money to supplement your classroom budget. What doesn’t sell can be used for next year’s classroom.

It’s possible local law enforcement might be willing to donate a few items too.

Below are only some of the great training offered by the American Academy of Forensic Science’s website (www.aafs.org). Please note: all email and website links are active.

NOVEMBER 2010

19-20
Cyril H. Wecht Institute of Forensic Science and Law 10th Annual Conference - Cause and Manner of Death Hosted by The Cyril H. Wecht Institute of Forensic Science and Law. To be held at Duquesne University in Pittsburgh, PA. CONTACT: wechtinstitute@duq.edu www.duq.edu/forensics (412) 396-1330

22-25
10th International Symposium on the Analysis and Detection of Explosives (ISADE) To be held at the The Shine Dome in Canberra, Australia. www.ncfs.edu.au/isade.html

29 – Dec 2
The Annual Conference & AGM of the Canadian Society of Forensic Science To be held at The Grand Hotel in Toronto, Canada. CONTACT: Monica.Sloan@ontario.ca

DECEMBER 2010

6-10
Basic Bloodstain Pattern Analysis Workshop Presented by the Specialized Training Unit at the Metropolitan Police Institute of the Miami-Dade Police Department, Doral, Florida. CONTACT: Toby L. Wolson, MS, F-ABC Miami-Dade Police Department Crime Laboratory Bureau 9105 N.W. 25th St. Doral, FL 33172 (305) 471-3041 Fax: (305) 471-2052 Twolson@mdpd.com

6-10
Forensic Evidence Course To be held at the Double Tree Hotel San Diego Mission Valley in San Diego, CA. www.ndaa.org/ncda

JANUARY 2011

10-14
Medicolegal Death Investigator Training Course Sponsored by Saint Louis University. To be held in St. Louis, MO CONTACT: Mary Fran Ernst or Julie Howe (314) 977-5970 http://medschool.slu.edu/mldi/

17-18
The Body as a Crime Scene: Forensics and Cold Case Investigations Seminar Presented by Dr Henry Lee with Dr Leah Bush and Richard Conway. To be held at George Mason University in Fairfax, Virginia. CONTACT: http://ocpe.gmu.edu/forcoldcase.html (703) 993-8335
Going On?

FEBRUARY 2011

20-21
2nd International Conference on Recent Advances in Forensic Sciences, Forensic Medicine & Toxicology Organized by Indian Association of Medico-Legal Experts (Regd). To be held at the Hotel Reveria De Goa in Ximer, Arpora, Bardez Goa- 403 518, India. CONTACT: http://www.iamleconf.in

MARCH 2011

14-18
Medicolegal Death Investigator Training Course Sponsored by Saint Louis University. To be held in St. Louis, MO CONTACT: Mary Fran Ernst or Julie Howe (314) 977-5970 http://medschool.slu.edu/mldi/

21-25
Basic Facial Reconstruction Sculpture To be held at the University of Oklahoma in Norman, OK. CONTACT: Betty Pat. Gatliiff (405) 321-8706 www.sculpture.outreach.ou.edu

21-25
Forensic Human Identification Course Hosted by the Queen Mary’s School of Medicine and Dentistry at the University of London. CONTACT: Professor Peter Vanezis +44(0)20 7882 3401 Cameron-forensics@qmul.ac.uk

28- Apr. 1
Advance Facial Reconstruction Sculpture To be held at the University of Oklahoma in Norman, OK. CONTACT: Betty Pat. Gatliiff (405) 321-8706 www.sculpture.outreach.ou.edu

30-Apr. 1
4th Annual Forensic Investigations Sponsored by Saint Luke’s Hospital of Kansas City. To be held at the Marriott Hotel in Kansas City, MO. CONTACT: Connie Brogan, RN (816) 617-7892 nurseline@saint-lukes.org or www.saintlukeshealthsystem.org/forensic

LATER 2011

June 13-17
Basic Bloodstain Pattern Analysis: To be held at The Bloodstain Forensic Institute in Corning, NY. CONTACT: Dr. Herbert Leon MacDonell (607) 962-6581 or forensicl@stny.rr.com.

September19-23
Basic Bloodstain Pattern Analysis: To be held at The Bloodstain Forensic Institute in Corning, NY. CONTACT: Dr. Herbert Leon MacDonell (607) 962-6581 or forensicl@stny.rr.com. This is the last time this course will be offered.

As many of you are aware already, some of your students don’t have the same stomach as the rest of the class. These are the kids who look ready to bring up their last meal when you talk about maggots or splash blood around. These kids always hang back when it comes time to check the decom study.

As cool as you and most of your students think forensics is, there will always be students who are there for various reasons, reasons that are different from the rest of the class. Forcing them to get close to rancid-smelling flesh, or watch videos they wouldn’t on their own is only going to turn them off to the subject. There’s a school of thought that says repeated exposure will help them acclimate, but you should let them do it at their own pace. This might mean asking anyone who is squeamish to notify you after class of their preferences. It might mean letting them go to the library and do a short report for you on the day everyone else watches the autopsy video.

There’s a reason not every professional in forensics works in pathology. We all have different strengths and preferences. Let your students find their own niche, and gradually work up to everything without being forced.
Selma Elmore, a 44-year old Lockland, Ohio woman, flagged down a passing police car and asked if there were any outstanding warrants out on her. When the cop checked and responded in the affirmative, Elmore fled. She was quickly apprehended and arrested.

A man wearing a black T-shirt and sunglasses hid in a closet of an Arlington, Texas, bank until the bank closed. He then emerged from the closet, brandished a weapon, and forced employees into the vault. A few minutes later he ran from the bank with $183,000. Four hours later police stopped Tyce Von Franklin who was doing 54 mph in a 40 mph zone. Officers searched his car and found marijuana, a gun, a surgical mask, and a very large amount of cash. He was also wearing the same shirt he wore during the robbery. Then the police began going through his cell phone. They found texts to Kyle Lightner, a teller at the bank, who had texted Von Franklin a few minutes before the robbery reminding him not to forget his sunglasses. He also warned Lightner about a co-worker who, “screams at scary movies, so be calm.” Lightner was arrested and the FBI is looking into another bank robbery in the area that followed the same MO. Coincidentally, Lightner was a teller at that bank when it was robbed.

James Johnson of Webster, Massachusetts, was arrested for drunk driving after he crashed his car into a house. This is his fourth arrest for DUI. When police arrived they found Johnson’s truck up on the front steps of a private residence. Johnson was alone, and sitting behind the wheel, but claimed his brother had been driving. At the time of his arrest Johnson was wearing a T-shirt that said, “I have a drinking problem.”

When police in Bradenton, Florida stopped 25-year old Raymond Roberts for speeding they smelled marijuana in his car and searched him. They found a bag of the drug wedged between his buttocks. When they also found another bag there, this one containing 27 pieces of crack cocaine he gave them the complete story. According to Roberts, the marijuana was his, but the crack wasn’t. He was arrested on the spot.

Earle Barranco walked into Chelsea’s Good Stuff Diner in New York and got into a dispute with with Corey Scott. Tempers flaired and Barranco drew a gun and shot Scott, killing him, an act witnessed by everyone in the diner. NYPD quickly figured out who he was and put out a nation-wide arrest warrant noting that Barranco was in possession of Scott’s diamond-encrusted moneybag on a gold chain. Barranco evaded police and fled to Charlotte, NC. While there he went to an NBA Charlotte Bobcats game and walked past a jumbotron camera as it zoomed in on him with his special, new jewelry. Fans recognized him, authorities were called, and he was nabbed the following week as he went to another game.

Police in Des Plaines, Illinois, used a not-so sophisticated method to track a man who was surprised by a female relative as he rifled through her jewelery. After he fled and the cops were called they noted the clear footprints going from her house to another house on the same block. What made the case even easier was the freshly fallen, undisturbed 10-inch snowfall that obscured everything with a pristine, wintery blanket. Undisturbed, that is, except for the evidence.

Matthew Nieveen of Nebraska was arrested on DUI and underage alcohol possession after driving erratically. His Halloween costume was an alcohol breathalyzer.
EXPERIENCE

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What teachers are saying

• “I am delighted to have found your website. It brings all the content we teach together in such a real-life way. It’s fantastic! Thank you for an amazing resource!”

• “I found this a fascinating site. I went through the first case because I am assigning it to my students as part of a CSI unit. I can’t wait to do the other two cases. Thank you for making science fun.”

This work was supported in part by a grant from the National Science Foundation to the Fort Worth Museum of Science and History.