

## Do You Know a Hero of Chemistry? Nominate them now

At the 2011 ACS Fall National Meeting in Denver, we will be honoring Heroes of Chemistry for the vital role these industrial chemical scientists and their companies play in improving human welfare through successful commercial innovations and products.

It presents an ideal opportunity to enhance the public image of the chemical and allied industries.

Each year, Heroes of Chemistry are nominated by their own companies to recognize their talent, creativity, and innovation.

More information can be found at [www.acs.org/industry](http://www.acs.org/industry)

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We will start momentarily at 2pm ET



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Tuesday, March 22, 2011

### Secrets to Getting the Most From the Anaheim ACS National Conference and Career Fair

Lisa Balbes, Balbes Consultants



Thursday, March 24, 2011

### Know Your Drugs: A Pharmacology Primer for Chemical and Life Science Professionals

Terry Kenakin, Director at GlaxoSmithKline Research and Development

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## ACS WEBINARS™

March 17, 2011



### *CSI Reality: Chemistry in the Crime Labs*



Jason Schaff,  
FBI Laboratory



Melissa Smrz,  
FBI Laboratory (Ret.)

Please submit your questions for the speaker via the Questions Panel in GoToWebinar

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# CSI REALITY:

## Chemistry in the Crime Labs

Dr. Jason E. Schaff  
Forensic Chemist  
FBI Laboratory, Quantico VA



March 17, 2011  
Washington, DC

## DISCLAIMER

All opinions expressed or implied herein are those of the speaker. None of them represent, in any way, official positions of the Federal Bureau of Investigation or of the United States Department of Justice.



March 17, 2011  
Washington, DC

# OUTLINE

- What is forensic chemistry?
- How forensics differs from other kinds of chemistry.
- What work is really like for forensic chemists.
- What forensic chemists do, and where they work.
- Closing thoughts and summary.
- Questions.

## WHAT IS FORENSIC CHEMISTRY?

From the American Heritage Dictionary:

**Forensic** - Relating to, used in, or appropriate for courts of law or for public discussion or argumentation.

**Chemistry** - The science of the composition, structure, properties, and reactions of matter, especially of atomic and molecular systems.

**Forensic chemistry** is the study of the structure, properties, and reactions of matter applied to, and consistent with the requirements of, legal proceedings.

**It isn't just criminal investigations!**

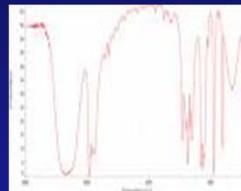
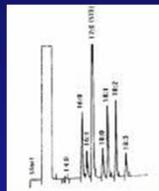
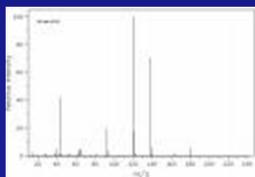
## WHAT KIND OF CHEMISTRY IS IT?

### Analytical Chemistry!

(very broadly defined)

Answers questions about the chemical nature of materials:

- What is that stuff?
- What's in that stuff?
- How much is in there?



Primarily instrumental analysis:

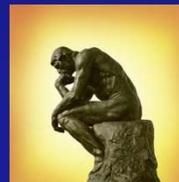
- Chromatography
- Mass spectrometry
- Optical spectroscopy



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## IT'S WHAT YOU CAN PROVE, NOT WHAT YOU KNOW!

- Mistakes can have real consequences for the safety, liberty, and even lives of real people!
- Well characterized equipment and methods are a must-have.
- Identification vs. Exclusion vs. ???



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## ROBUSTNESS, NOT ELEGANCE

- Methods need to work the first time, every time, and all the time.
  - Within the limits of an imperfect world!
- Failure needs to be *blindingly obvious*.
- Powerful technology is great, but never forget the simple techniques.



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## IT'S NOT JUST THE SCIENCE

- Good quality control practices.
- Everything needs to be documented.
  - historical method performance
  - equipment calibration / maintenance
  - reagent and control material preparation
- **CHAIN OF CUSTODY!**



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## ADVERSARIAL LEGAL PROCESS

- Making the science understandable to a non-technical jury.
- Lawyers have one job – *winning!!*
- Without proper demeanor and composure, the science won't matter.



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## LIFE IN FORENSIC CHEMISTRY

### The Good

- The opportunity to make a difference
- Wide range of types of work
- Tight professional communities
- Fun toys!



### The Bad

- Lower pay than in some fields
- Odd hours
- Tightly regulated work process
- Confidentiality restrictions

### The Ugly

- Potential for a high "Yuck!" factor
- Disturbing and depressing cases
- Lawyers!
- The "CSI Effect"
- Inconclusive results



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## REAL LIFE ISN'T LIKE CSI...

- We aren't that fast.
- We aren't that generalized.
- We never "crack the case".
- Some questions can't be answered.
- Need to remain detached.
- We (mostly) work in the lab, not the field.
- We (mostly) don't carry guns.
- We (mostly) aren't that stylish.



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## ...EXCEPT WHEN IT IS

- We do have lots of cool toys.
- We do get to make a difference.
- We do get excited about our work.
- Some of us do have a very warped sense of humor.
- There really are people in this world as evil as the TV villains.



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## FIELDS AND DISCIPLINES WITHIN FORENSIC CHEMISTRY

- **Toxicology**

- coroner / ME work
- product tampering
- sexual assaults
- driving under the influence



- **Materials Analysis**

- metallurgy
- polymer analysis
- paints / coatings
- mineralogy
- failure analysis



- **Residue Analysis**

- controlled substances
- arson
- oils and lubricants
- general unknowns
- post-blast explosives



- **General Chemistry**

- controlled substances
- inks and dyes
- general unknowns
- product tampering



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## FOUR DIFFERENT MODELS OF LABORATORY OPERATION

### Single Scientist

- One scientist performs all lab work, writes reports, and testifies.
- For non-parallel single-discipline work – e.g. drug seizures.

### Multiple Scientists

- Several scientists perform different lab work on the same evidence.
- Usually only one scientist reports and testifies.
- For work with many exams or disciplines required – e.g. product tampering.

### Certifying Scientist

- All lab work performed by technicians.
- Certifying scientists only review data, write reports, and testify.
- For fast turnaround batch work – e.g. DUID investigations.

### Confirming Scientist

- One scientist performs all initial lab work, and another repeats work to confirm results.
- Usually one report by first scientist.
- Rare, except in materials analysis.



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## EDUCATIONAL REQUIREMENTS

- Most employers would rather teach a good scientist the legal side of the work than the other way around.
- Good hands-on scientists are always better than good degrees.
- Many skills outside of laboratory science can be important for forensic scientists:
  - writing and critical reading
  - public speaking and rhetoric
  - ethics and logic
  - statistics
  - computer science and electronics



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## FORENSIC CHEMISTRY CAREERS

### Employers

- Federal, state, local law enforcement
- Coroner / ME labs
- Fire departments
- Military
- Private contract labs
- Institutes and public advocacy groups
- Universities
- Legal and consulting firms

### Job Types

- Field investigators (arson, explosives)
- Lab technicians
- Bench scientists
- Supervising scientists
- Research scientists
- Operational support personnel
- Educators
- Professional experts
- Policy advisors

### Comments

- Some employers have generous continuing education programs.
- A small number of law enforcement agencies still require supervisors to be sworn officers.
- Budget problems are limiting hiring by public agencies, but there will always be crime to investigate.



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## CLOSING THOUGHTS

- Forensic chemistry is applied analytical chemistry.
- Very good science can be rendered irrelevant by failing to consider legal and administrative issues.
- CSI is a TV show: the real world of forensic science is not so simple, but can be just as interesting.
- There are a variety of careers in forensic chemistry available for good scientists.



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## QUESTIONS?



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## Q&A SESSION



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