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Lisa Balbes, Balbes Consultants

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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.)

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CHEMISTRY IN THE CRIME LAB:

What they don't tell you on CSI!

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

ACS Chemistry for Life®

March 17, 2011
Washington, DC

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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!

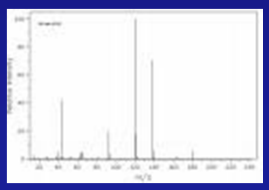
WHAT KIND OF CHEMISTRY IS IT?

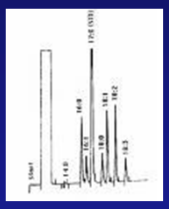
Analytical Chemistry!

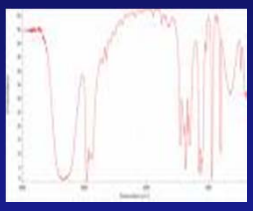
(very broadly defined)

Answers questions about the chemical nature of materials:

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





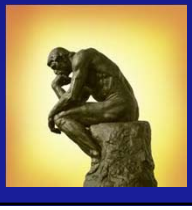


Primarily instrumental analysis:

- Chromatography
- Mass spectrometry
- Optical spectroscopy

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. ???



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.

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!***

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.

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

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.

...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.

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

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.

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

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.

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.

QUESTIONS?

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Q&A SESSION

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