Educating the Next Generation of Forensic Scientists

Victor W. Weedn, MD, JD
George Washington University

Friday, 2:00 – 3:00, 6/2/2017
Nicolas de La Reynie was appointed Lieutenant General of the Police by French King Louis XIV on March 15, 1667—probably the first police chief.

Oversaw “city safety, gun control as prescribed by royal ordinances, street cleaning, flood and fire control”
Evolution of Policing

1361 Justice of the Peace Act
1666 King Louis XIV’s Police
1748 Fielding’s Bow Street Runners
1800 Joseph Fouché’s Police
1812 Eugene Vidocq’s La Sûreté Nationale
1829 Robert Peel’s Scotland Yard
1844 NYC Police
1842 London Detective Branch
1850 Pinkerton National Detective Agency
1857 NYC Detectives
1865 United States Secret Service
1893 Hans Gross
1905 Federal Bureau of Investigation
1920 Dept of Treasury T-men
1932 FBI Crime Lab

1893 Hans Gross, Handbook on Criminal Investigation
Prof of Criminal Law, Univ of Graz, Austria

1910 Lyon Crime Lab, Edmond Locard

1910 Berkeley “Crime Lab”, August Vollmer

1924 LA Scientific Investigation Dept, August Vollmer

1932 FBI Crime Lab

1948 AAFS

1948 Genetic Analyzer

1960 GC

1974 GC-MS

1977 FTIR

1985 DNA

Evolution of Forensic Science

Comparison Microscope

GC-MS
1893  Hans Gross, *Handbook on Criminal Investigation*
Prof of Criminal Law, Univ of Graz, Austria

1902 Lausanne Forensic Photography Dept, R.A. Riess

1909 Lausanne Institute of Police Science, R.A. Riess

1910 Lyon Crime Lab, Edmond Locard

1910 Berkeley “Crime Lab”, August Vollmer

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1924 LA Scientific Investigation Dept, August Vollmer

1924 LA Scientific Investigation Dept, August Vollmer

1930 San Jose State College Police School

1930 UC Berkeley Police Sciences, August Vollmer

1937 Kirk takes over Berkeley Criminology

1932 FBI Crime Lab

1945 Berkeley Technical Crim, Paul Kirk

1947 MSU Police Science, Ralph Turner

1948 AAFS

1949 School of Criminology, Paul Kirk

1950 School of Criminology, Paul Kirk

1960 GC

1974 GC-MS

1977 FTIR

1985 DNA

Comparison Microscope

Genetic Analyzer
Rudolphe Archibald Reiss

Born in Germany, the eighth of ten children. He studied in Switzerland, obtaining his Ph.D. in chemistry at 22. He became an expert in photography and forensic science. In 1906 he was appointed a professor of forensic science at the University of Lausanne and in 1909, founded the "Institut de police scientifique". He published two books on forensic science "Photographie judiciaire" in 1903 and "Manuel de police scientifique. I Vols et homicides" in 1911.
In the spring of 1930, SJSC President MacQuarrie asked Police Chief August Vollmer about technical training in the police field.

Also see: http://www.sjsu.edu/justicestudies/our-department/history-misson/
San Jose State College
Police School

“Police departments cannot employ new men until they are twenty-one years of age, and some cities will consider no one under twenty-five. The young man who graduates from high school at nineteen and plans to enter the police service must wait several years for his opportunity. The question is what he shall do with the years between.”

San Jose State College Police School

“our technical offering. In general it includes such courses as law of arrest, evidence, court procedure, criminal law, police practice, investigation, identification, traffic, records, gunnery, photography, communications, boxing, wrestling, swimming, first aid, and typing.”

UC Berkeley

Vollmer became Marshall in 1905 and Police Chief in 1909
1910 Berkeley “crime lab” – Vollmer
1916 UC Berkeley Criminal Justice, Sch of Political Science – Vollmer
1924 Los Angeles Scientific Investigation Depart – Vollmer
1930 UC Berkeley Police Science – Vollmer
1937 UC Berkeley Criminology – Kirk
1945 UC Berkeley Technical Criminology degree – Kirk
1950 UC Berkeley School of Criminology – Kirk
   (1969 D Crim – Deforest, Sensabaugh, Peterson)
1976-1995 UC Berkeley School of Public Health – Thornton, Sensabaugh

August “Gus” Vollmer
1876-1955
“the father of modern policing”

Paul L. Kirk
1902-1970
“the father of criminalistics”
### STATUS OF FORENSIC SCIENCE DEGREE PROGRAMS IN THE UNITED STATES

JL Peterson; PR DeForest

<table>
<thead>
<tr>
<th>#</th>
<th>Institution</th>
<th>Year</th>
<th>Degree(s)</th>
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<tbody>
<tr>
<td>1</td>
<td>MSU</td>
<td>1947</td>
<td>BS, MS</td>
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<tr>
<td>2</td>
<td>UC Berkely</td>
<td>1950</td>
<td>BS, MS. D Crim</td>
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<tr>
<td>3</td>
<td>Cal State</td>
<td>1957</td>
<td>MS</td>
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<tr>
<td>4</td>
<td>N Ariz</td>
<td>1959</td>
<td>BS, MS</td>
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<tr>
<td>5</td>
<td>GWU</td>
<td>1968</td>
<td>MS, MFS</td>
</tr>
<tr>
<td>6</td>
<td>John Jay</td>
<td>1968</td>
<td>BS, MS</td>
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<td>7</td>
<td>U Pitt</td>
<td>1969</td>
<td>MS</td>
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<tr>
<td>8</td>
<td>Buffalo</td>
<td>1971</td>
<td>BS</td>
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<td>9</td>
<td>Georgetown</td>
<td>1972</td>
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<td>10</td>
<td>UIC</td>
<td>1972</td>
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<tr>
<td>11</td>
<td>UNH</td>
<td>1972</td>
<td>BS</td>
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Then another 11 in the next 3 yrs

Presented at AAFS 1976
Resistance to Forensic Science Programs

- FBI Training Academy
- Lack of Substance/Insufficient Science
- Lack of Fed Grant Funding
- Lack of Interest in Applied Science
- Liberal Bias against Law Enforcement
LEAA (1968-1982)

The LEAA was established by the Omnibus Crime Control and Safe Streets Act of 1968 and was abolished in 1982. Its predecessor agency was the Office of Law Enforcement Assistance (1965–1968). Its successor agencies were the Office of Justice Assistance, Research, and Statistics (1982–1984) and the Office of Justice Programs (1984–). It administered federal funding to state and local law enforcement agencies, and funded educational programs, research, state planning agencies, and local crime initiatives.  wikipedia

Funded:
• Creation of crime labs
• Development of FS educational programs
• Police training
STATUS OF FORENSIC SCIENCE DEGREE PROGRAMS IN THE UNITED STATES

JL Peterson; PR DeForest
By 1976, 22 colleges and universities with certificate or degree programs in forensic science were identified and conferred 275 BS, 249 MS, and 11 Doctoral students.
Early crime laboratories were staffed by chemists, biologists, and a combination of police professionals (firearms, toolmark, fingerprint, and questioned-document examiners), as well as a few individuals trained in criminalistics at the University of California at Berkeley, Michigan State University, and John Jay College of Criminal Justice in New York. Although there was a rapid growth of college and university-based criminalistics degree programs nationwide, there was little standardization of coursework or recognition of the need for minimum faculty qualifications.
Sensabaugh/Thornton – UC Berkeley
Gaensslen/Lee – Univ of New Haven
DeForest – John Jay CUNY
Siegel – Michigan State Univ
Rowe – George Washington Univ
Liu – Univ of Alabama, Birmingham
Others …
Multiple Faculty

Single Faculty
GWU

1968 – Program with
  3 Part-time faculty
1975 – Department with
  2 Full-time faculty
  5 Part-time faculty
2014 – Department with
  11 Full-time faculty
  16 Part-time faculty
Quincy, M.E.

1976-1983
CSI premiered on CBS on October 6, 2000. The show was created by Anthony E. Zuiker and produced by Jerry Bruckheimer. It was rated in the top 10 from 2000 to 2010 and has been rated the most popular dramatic series internationally three times.
Explosion of Programs

>300 Forensic Science programs?
But still only 450 crime labs

BS (chem) -> BS(FS) -> MFS
=> very competitive environment
Technical Working Group for Education and Training in Forensic Science

TWGED

2003 Report published as

NIJ Special Report June 2004 (NCJ 203099)
TWGED Members

Education and Training in Forensic Science Planning Panel

1. Dr. Jack Ballantyne
2. Mark Dale
3. Dr. Allison Eastman
4. Linda Errichetto
5. Dr. Terry Fenger
6. Barry Fisher
7. Dr. Jane Homeyer
8. Peter Marone
9. Dr. Carl Selavka
10. Dr. Ian Tebbett
11. Dr. Michael Yura

Additional Technical Working Group Members

12. Dr. José Almirall
13. Kathleen Barch
14. Dr. Clifton Bishop
15. Garry Bombard
16. Dr. Robert Briner
17. Dr. Michael Bourke
18. Dr. Yale Caplan
19. Elizabeth Carpenter
20. Alan Clark
21. Dr. Peter DeForest
22. Dr. Christopher D’Elia
23. Dr. Jamie Downs
24. Dr. David Foran
25. Dr. James Fox Lipman
26. Dr. Robert Fraas
27. Dr. Robert Gaenssslen
28. Dr. Howard Harris
29. Dr. Neal Haskell
30. Carol Henderson, J.D.
31. Dwane Hilderbrand
32. Karen Irish
33. Susan Johns
34. Dr. Graham Jones
35. Dr. Karen Kershenstein
36. Kevin Lothridge
37. Joseph Polski
38. Lawrence Presley
39. Victor Reeve
40. Gerald Richards
41. Dr. Kathy Roberts
42. Linda Rourke
43. Dr. George Sensabaugh
44. Dr. Charles Tindall
45. Dr. Victor Weedn
46. Dr. Jeffrey Wells
47. Wayne Williams, J.D.
48. Amy Wong
49. Kenneth Zercie
What does the working group recommend?
A solid educational background in natural sciences with extensive laboratory coursework establishes the groundwork for a career in forensic science. Strong personal attributes, professional skills, certification, and professional involvement also are critical to the professional growth of prospective and practicing forensic scientists.
FEPAC
Forensic Science Educational Program Accreditation Commission

First accreditation in 2004
# FEPAC Accredited Programs

## GRADUATE PROGRAMS

1. Arcadia University  
2. Boston University School of Medicine  
3. Cedar Crest College  
4. Duquesne University  
5. Florida International University  
6. George Washington University  
7. Indiana University Purdue University, Indianapolis  
8. Marshall University  
9. Michigan State University  
10. Oklahoma State University  
11. Pennsylvania State University  
12. Sam Houston State University  
13. Towson University  
14. University of Alabama at Birmingham  
15. University of Illinois at Chicago  
16. University of New Haven  
17. Virginia Commonwealth University  
18. West Virginia University

## UNDERGRADUATE PROGRAMS

1. Albany State University  
2. Alfred State-SUNY College of Technology  
3. Buffalo State (SUNY)  
4. Cedar Crest College  
5. Eastern Kentucky University  
6. Fayette State University  
7. Florida International University  
8. Indiana University Purdue University, Indianapolis  
9. Laurentian University  
10. Loyola University at Chicago  
11. Madonna University  
12. Ohio University  
13. Pennsylvania State University  
14. Texas A&M University  
15. Towson University  
16. University of Central Oklahoma  
17. University of Mississippi  
18. University of New Haven  
19. University of North Texas  
20. University of Ontario Inst of Technology  
21. University of Tampa  
22. Virginia Commonwealth University  
23. West Chester University of Pennsylvania  
24. West Virginia University

*as of 3/4/17*
American Board of Criminalistics (ABC)

FORENSIC SCIENCE ASSESSMENT TEST (FSAT) EXAMINATION

- Forensic biology
- Controlled substances
- Trace analysis
- Toxicology
- Latent Prints
- Questioned documents
- Fire Debris
- Firearms/Toolmarks
APPRENTICESHIPS:

Questioned Documents Examination
Firearms & Toolmarks Examination
Latent Print Examination
GENERALLY NOT COVERED IN TRADITIONAL FORENSIC SCIENCE PROGRAMS

- Forensic Pathology*
- Medicolegal Death Investigation*
- Forensic Odontology*
- Forensic Nursing
- Forensic Psychiatry
- Forensic Psychology
- Forensic Entomology*
- Forensic Botany
- Microbial Forensics
- Forensic Palynology
- Wildlife Forensics
- Veterinary Forensics
- Forensic Engineering
- Forensic Accounting ...

* Primarily Death Investigation

Medical/Clinical

Biology/Zoology

Other
Traditional Forensic Science Programs

- Forensic Investigation (CSI)
- Forensic Laboratory (criminalistics)
- Computer Forensics / Digital Evidence
GREATER SPECIALIZATION
CHEMISTRY

Drug Chemistry

Trace Evidence

Firearms/Toolmarks

Questioned Documents

Latent Prints

"Police Science"

Criticized for Insufficient Scientific Foundation

BIOLOGY

DNA

CSI

"Police Science"
Traditional PhD Program

What I would like to do:

Student → Practitioner

For Sci Research Professor

Non-For Sci Research Professor

What I would like to do:

Practitioner → Professor

Physico-Chemical Interrogation
- Materials Scientist
- 3D Spatial / Pattern Analysis
- Digital Image Processor
- Measurements
- Metrologist (Tribologist)
- Statistical Interpretation
- Statistician
- Bias Human Factors
- Cognitive Psychologist
PhD Programs

- Biology PhD w/ FS Focus
- Chemistry PhD w/ FS Focus
- CJ w/ FS Focus
- Interdisciplinary Studies – JJ CUNY
- Forensic Molecular Biology – UNT
- Forensic Chemistry – FIU, Albany
- Forensic Science – SHSU, WVU, Lausanne, Strathclyde, etc
Research is key to teaching critical thinking and to advancing the profession.
1874 – Johns Hopkins dies leaving $7M for hospital and school
1889 – The hospital is opened, but the school is $0.5M short
   The trustees attempt to raise the funds for the school
   Four daughters offer to raise the funds with conditions
      --rejected multiple times, then daughters raised the funds
1893 – School opened with goal of advancing scientific medicine
   Conditions:
      - equality of men and women
      - graduates of college
      - studied biology and performed well academically
      - ability to read French and German medical literature
   Faculty: Welch, Osler, Halstead, Kelly, Mall, Abel
1910 – Flexner report (funded by Carnegie Foundation)
1912 – Flexner reforms ($50M by Rockefeller Institute)

=> Revolutionized Medicine
2016 Federal R&D Obligations (Preliminary)

DOJ
$151.5M (~0.1%) of $143B

NSF Survey of Federal Funds for Research and Development, FY 2015-17, table 3
FY16 DOJ R&D Obligations
(Preliminary)

NSF Survey of Federal Funds for Research and Development, FY 2015-17, table 6
FY16 DOJ R&D Obligations (Preliminary)

- Universities: $55.5M
- Nonprofits: $46.1M
- Industry: $15.9M
- Intramural: $5.7M
- State & Local Govt: $6.3M

Source: NSF Survey of Federal Funds for Research and Development, FY 2015-17, table 17
FY 2016 NIJ Forensic Science Grants

$126M on 310 awards – includes capacity building grants
Collect, identify, classify, and analyze physical evidence related to criminal investigations. Perform tests on weapons or substances, such as fiber, hair, and tissue to determine significance to investigation. May testify as expert witnesses on evidence or crime laboratory techniques. May serve as specialists in area of expertise, such as ballistics, fingerprinting, handwriting, or biochemistry.

Employment: 14,800  Mean Hourly Wage: $29.18  Annual Mean Wage $61K
<table>
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<tr>
<th>BJS Census Rpt date</th>
<th>Requests (millions)</th>
<th>Backlog (millions)</th>
<th>Budget (million$)</th>
<th>FTEs (thousands)</th>
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<td>1.154</td>
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<td>13.1</td>
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<td>2014</td>
<td>3.8</td>
<td>0.57</td>
<td>1.7</td>
<td>14.3</td>
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<tr>
<td>Δ%</td>
<td>31%</td>
<td>99%</td>
<td>70%</td>
<td>30%</td>
</tr>
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</table>
FUTURE DEMAND

DNA  – Property Crimes
Tox/Chem  – Opioid Crisis, NPS
Trace Evid  – New Technology
Dig Evid  – IoT, Intelligence
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