

**Forensic Geosciences
in the
United Kingdom and United States**



Marianne Stam

*California Department of Justice
and*

Raymond Murray

Missoula, Montana

PREMISE:

- Forensic Geosciences - currently enjoying a renaissance in the U.K., but not in the U.S.
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- Notable trends support this concept.
- Possible reasons for these differences.
- Two examples will illustrate different approaches to forensic geoscience cases in the U.K. and the U.S.

Study Approach

- Literature searches of forensic geoscience articles and books (excluding related publications on burial sites, palynology, and diatoms).

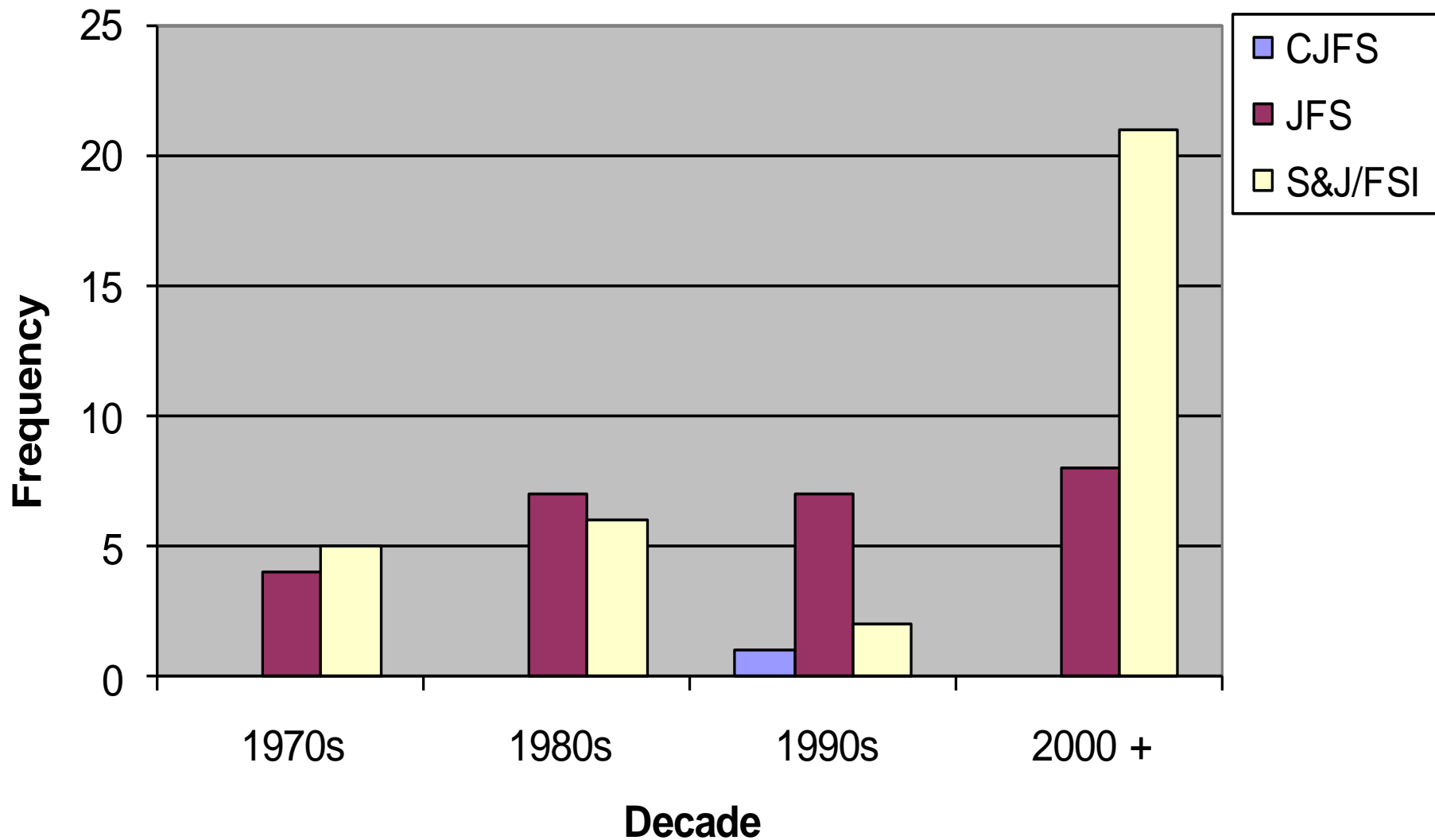
Sources:

- California Criminalistics Institute Library Search 2008
- Journal of Forensic Sciences: 1975 - Present
- Journal of the Forensic Science Society/Science and Justice: 1973 - Present
- Forensic Science International 1975 to Present
- Pye and Croft: Forensic Geoscience: Principles, Techniques and Applications, (2004)
- Pye, K. Geological and Soil Evidence, Forensic Applications. 2007

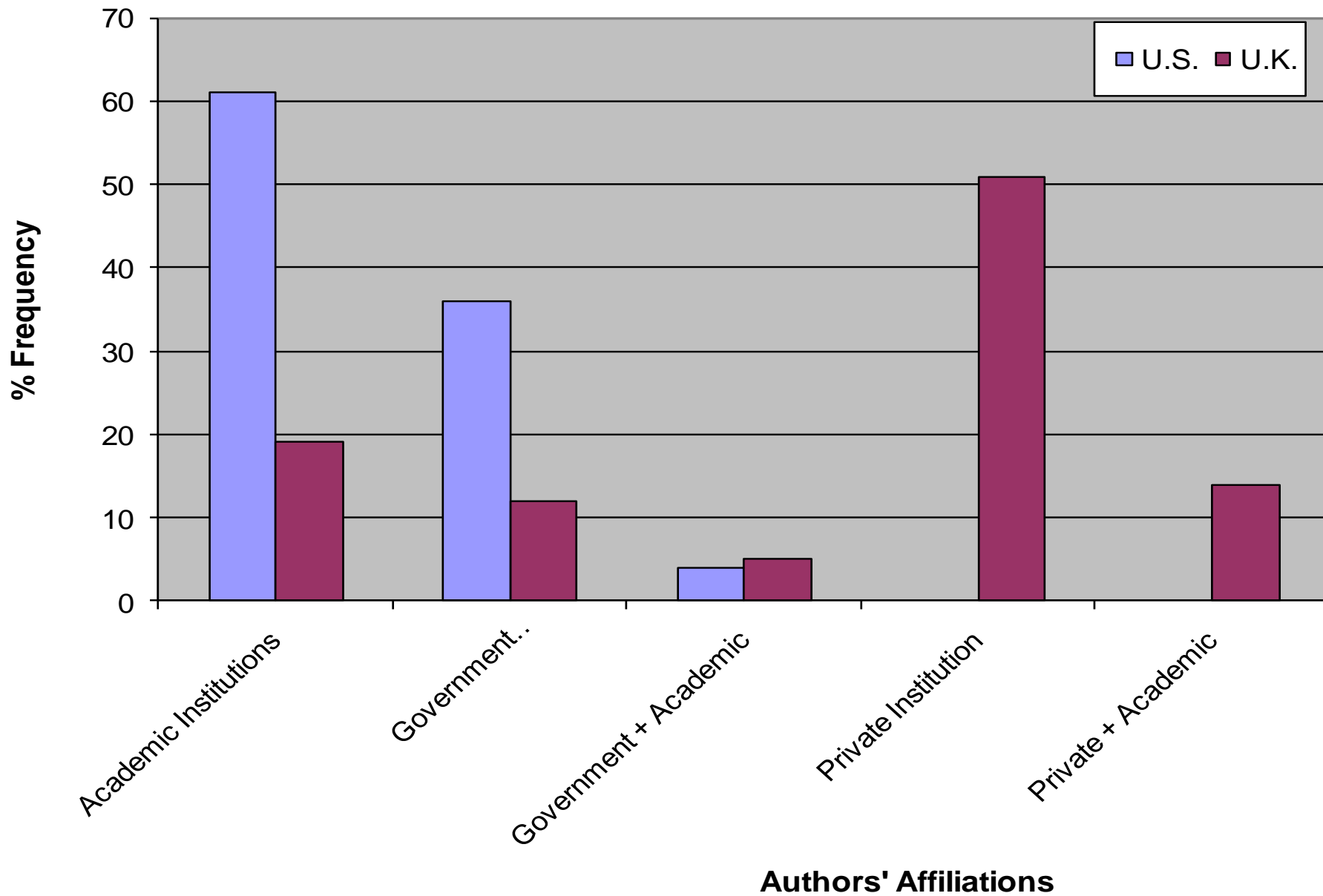
Notable Trends

- Past 8 years, U.K. authors have published many more papers and books on Forensic Geoscience than U.S. authors.
- Of the published articles, authors in the U.K. are affiliated more with private companies or academic institutions; authors in the U.S. with academic or government institutions.
- Methods of analysis and the measured soil properties are more traditional in the U.S. than in the U.K.
- More sophisticated methods of analyses and measured soil properties are associated with publications by authors from private or academic institutions.

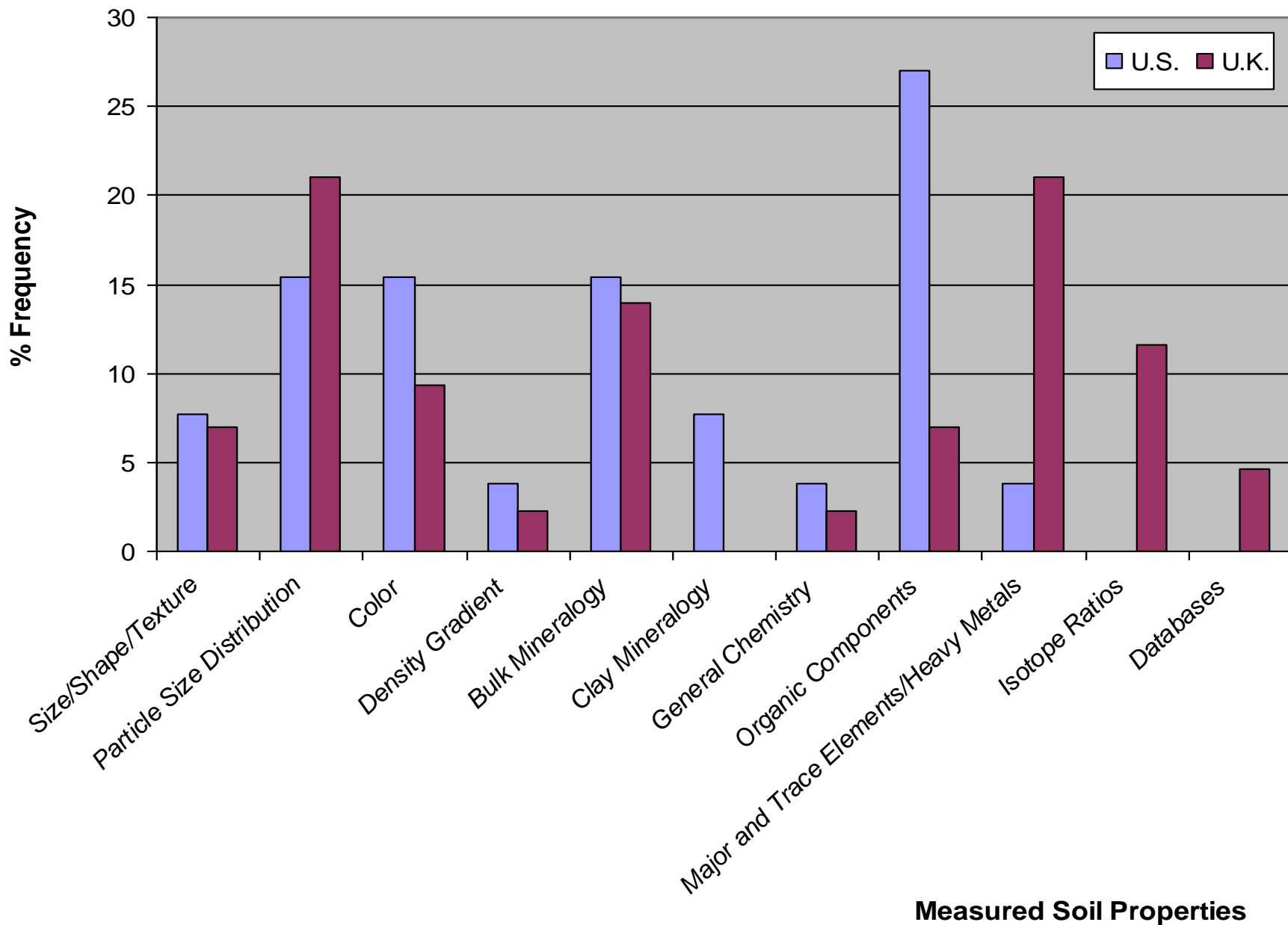
Forensic Geoscience Articles in Forensic Science Publications from the 1970s to the Present



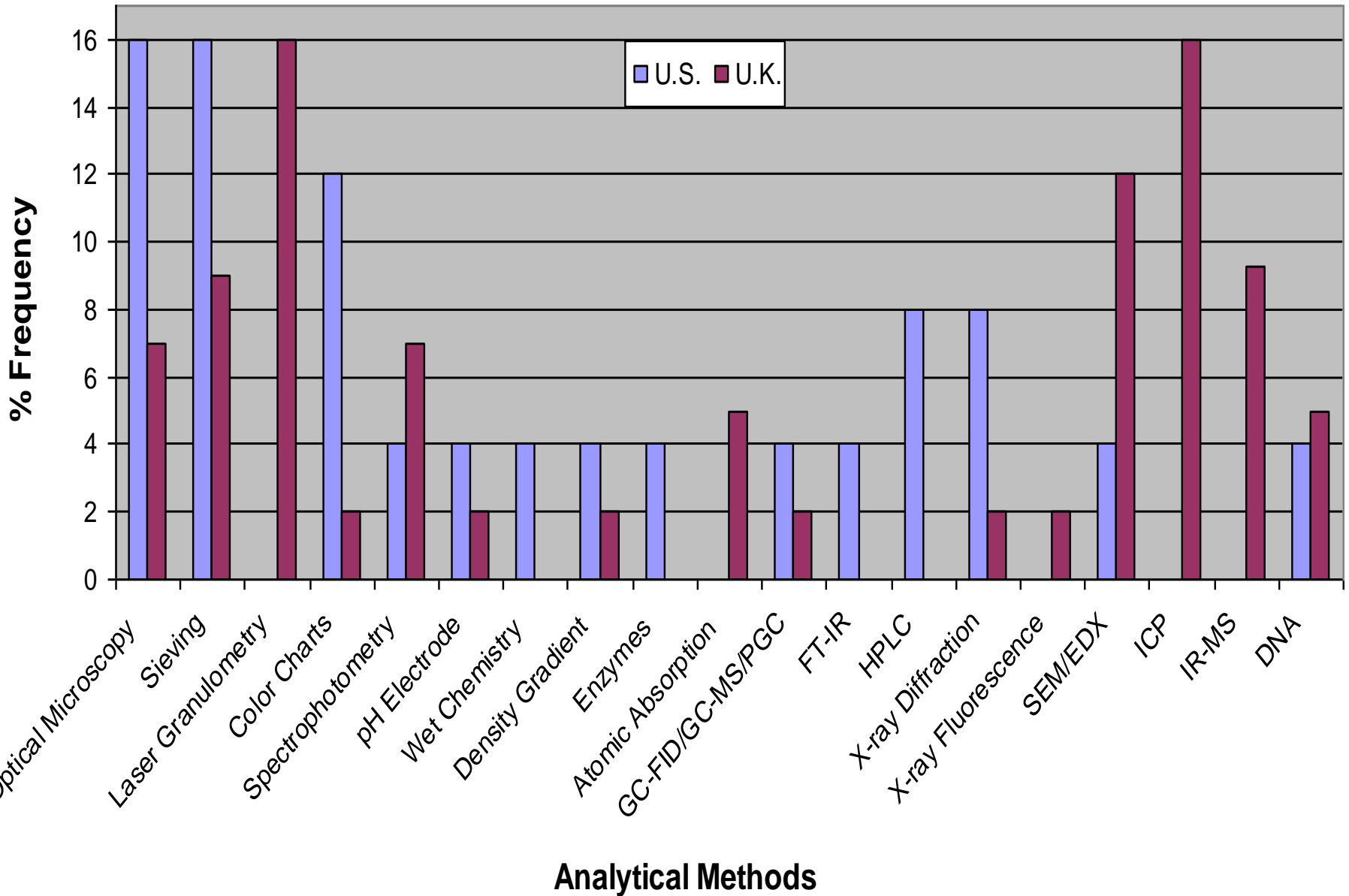
% Frequency of Published Forensic Geoscience Articles by Authors' Affiliations: U.S. vs. U.K.



Measured Soil Properties: % Frequency of Use in Published Forensic Geoscience Literature: U.S. vs U.K.



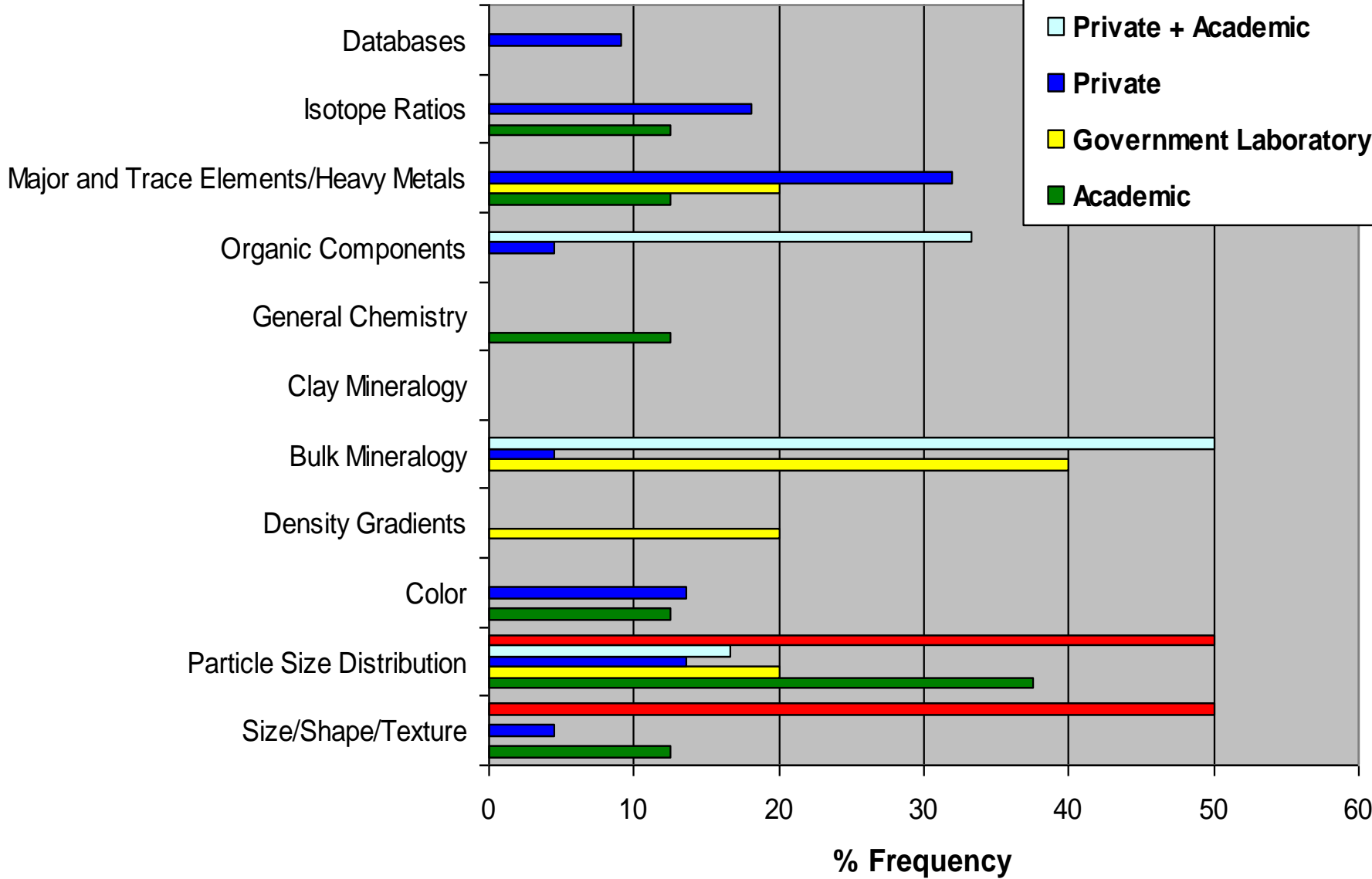
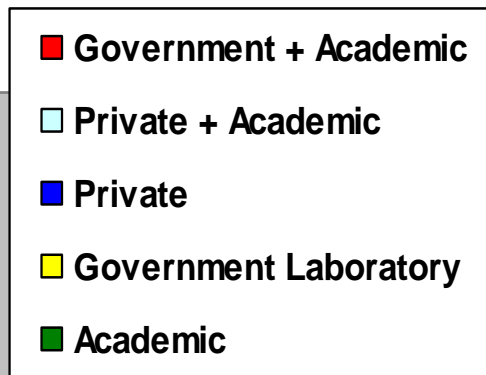
% Frequency of Analytical Methods Applied to Forensic Soils Testing in Published Forensic Geoscience Literature: U.S. vs. U.K.





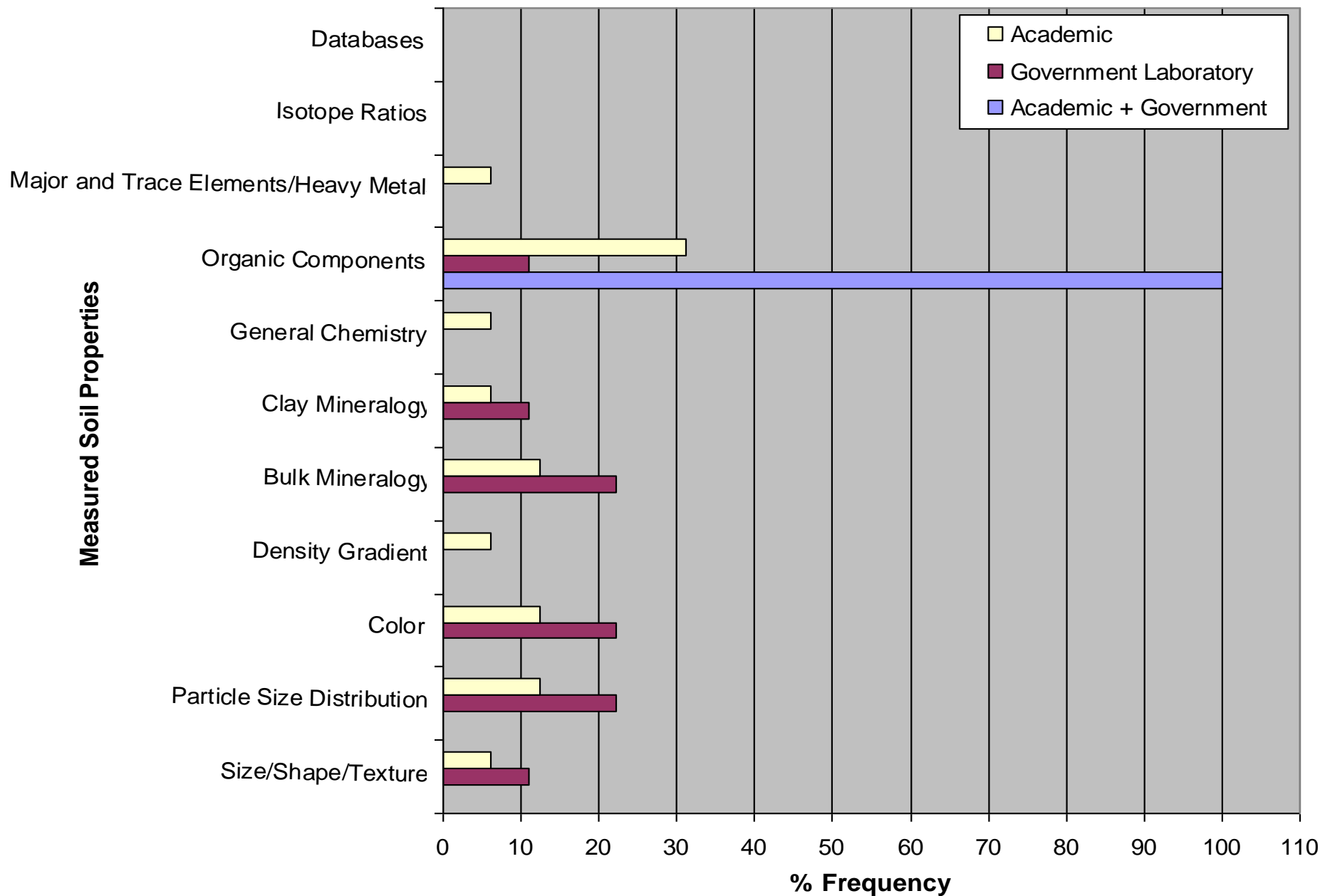
% Frequency of Measured Soil Properties in Published Forensic Geoscience Literature by Affiliation - UK

Measured Soil Properties





% Frequency of Measured Soil Properties in Published Forensic Geoscience Literature by Affiliation: U.S.



Privatization of Forensic Science:



- 1991 Forensic Science Service began selling services as an agency
- 2005 FSS became a GovCo

Many scientists left to open private laboratories

Academics became major providers of forensic data

University instrumentation becomes available

Competition among providers lowered costs

Research at former government labs decreased

Quality control became a major issue

Academic and private labs began to actively publish a lot of forensic related articles/books.

- **2010 FSS closes**

Case Examples



USA Case

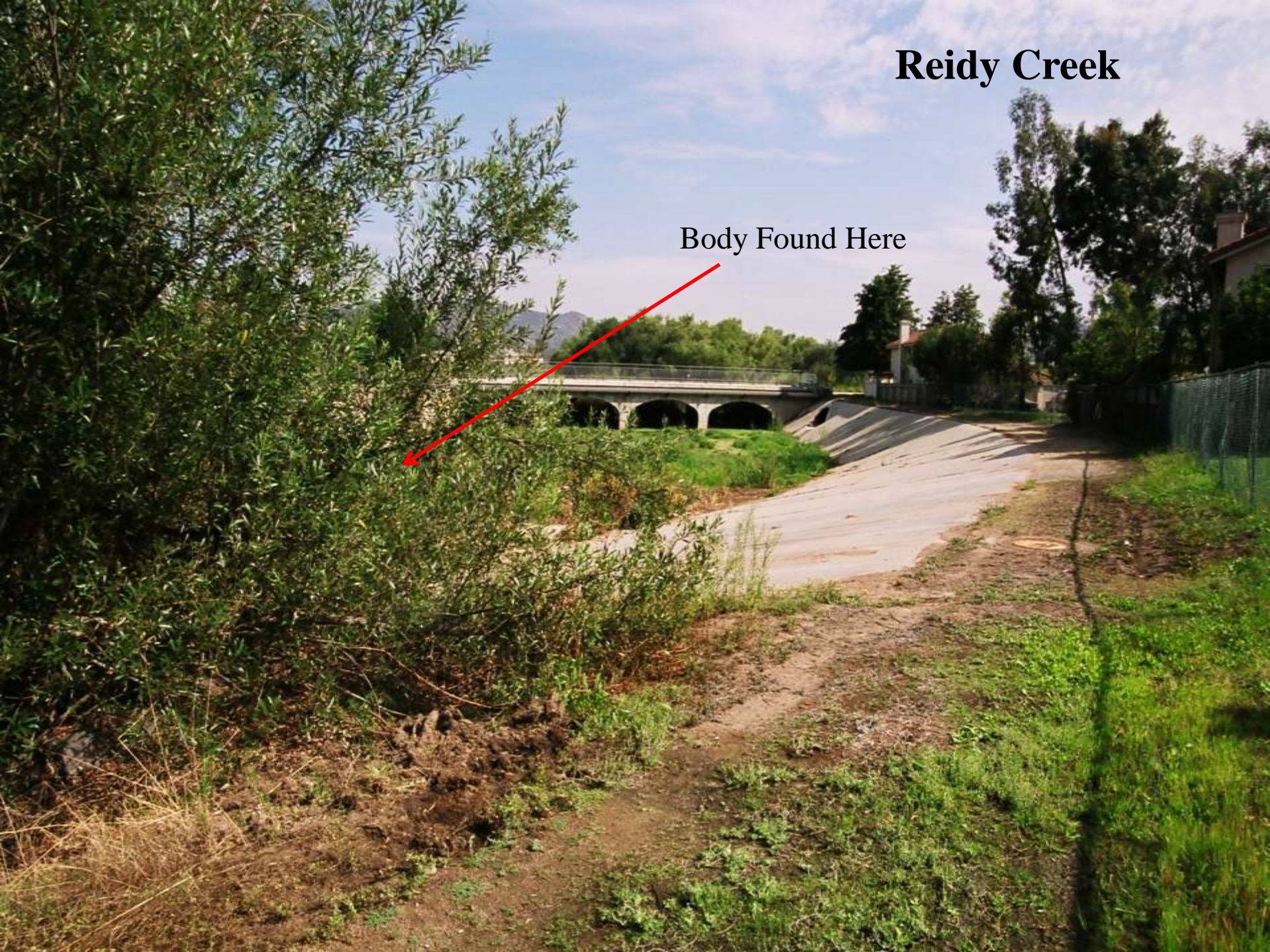


- Suspect Bennette Douglas was charged with the murder of two female acquaintances.
- Douglas killed his victims and buried them in different places in northern San Diego County, California.
- Both sites were within the Peninsular Range Batholith and were within 5 miles of each other.



Reidy Creek

Body Found Here





Body Found Here

Mountain View Park

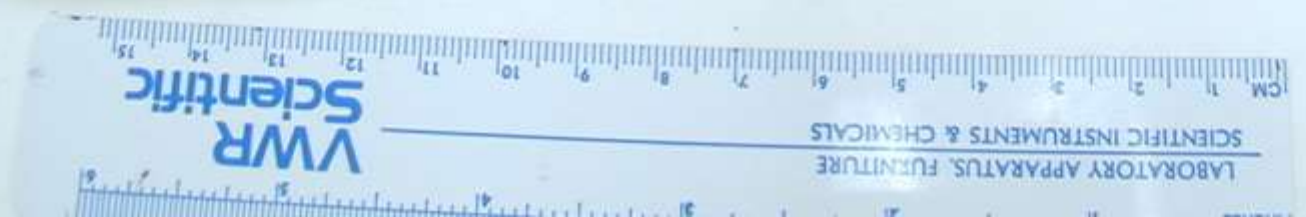
The Evidence

- Two shovels and a hoe all with adhering soil were found in the suspect's garage.
- These along with soil samples from the burial sites were submitted to the laboratory for analyses.

LABORATORY APPARATUS: FURNITURE
SCIENTIFIC INSTRUMENTS & CHEMICALS

VWR
Scientific





Examinations

- Samples were examined for:
 - Color
 - Particle size distribution
 - Mineralogy

Examination Methods

- Whole Samples (color and grain morphology)
- Sieved Samples (color and grain morphology)
- 90 to 180 micron fraction:
 - Whole fraction (Mineralogy)
 - Light Minerals - Separation (Mineralogy)
 - Heavy Minerals - Separation (Mineralogy)

Examination Techniques

- Stereomicroscopy
- Polarizing Light Microscopy (PLM)
- X-ray Diffraction – Used instrument at local university.

Results

- Soil from Hoe - different color/aggregate morphology than soils from either burial site.
- Soil from both shovels - different color/grain sizes/aggregate morphology and plant material than soils from Reidy Creek burial site.

- Soil on one shovel similar in color, particle size distribution, and mineralogy to Mountain View Park burial site.
- Soil on other shovel is similar in most features to Mountain View Park site; however, differs in having fewer zircons.
- X-Ray Diffraction results confirmed microscopy data.



U.K. Case Example



- Robert Young -A Northern Ireland Loyalist paramilitary gang member and drug dealer was convicted of murder in 2005.
- Use of QEMSCAN, an automated SEM fitted with Energy Dispersive X-ray spectrometers was important in providing crucial analytical data leading to the conviction of Mr. Young.



- Young suspected of being one of two gunmen who shot and killed a rival gang leader.
- During their escape, the gunmen were believed to have fled through a yard containing waste materials including plaster board.
- Young was apprehended and his car was searched.
- Small amount of plaster board was observed on the floorboard of Young's vehicle.

- Gypsum was identified using x-ray diffraction in plaster board samples from Young's car and from the yard along the escape route.
- QEMSCAN showed the samples had similar chemical compositions including minor/trace elements; and similar textural features.
- These samples differed in minor/trace elements and textural features from four commercially available plaster board samples that were also tested using QEMSCAN.

Study Conclusions

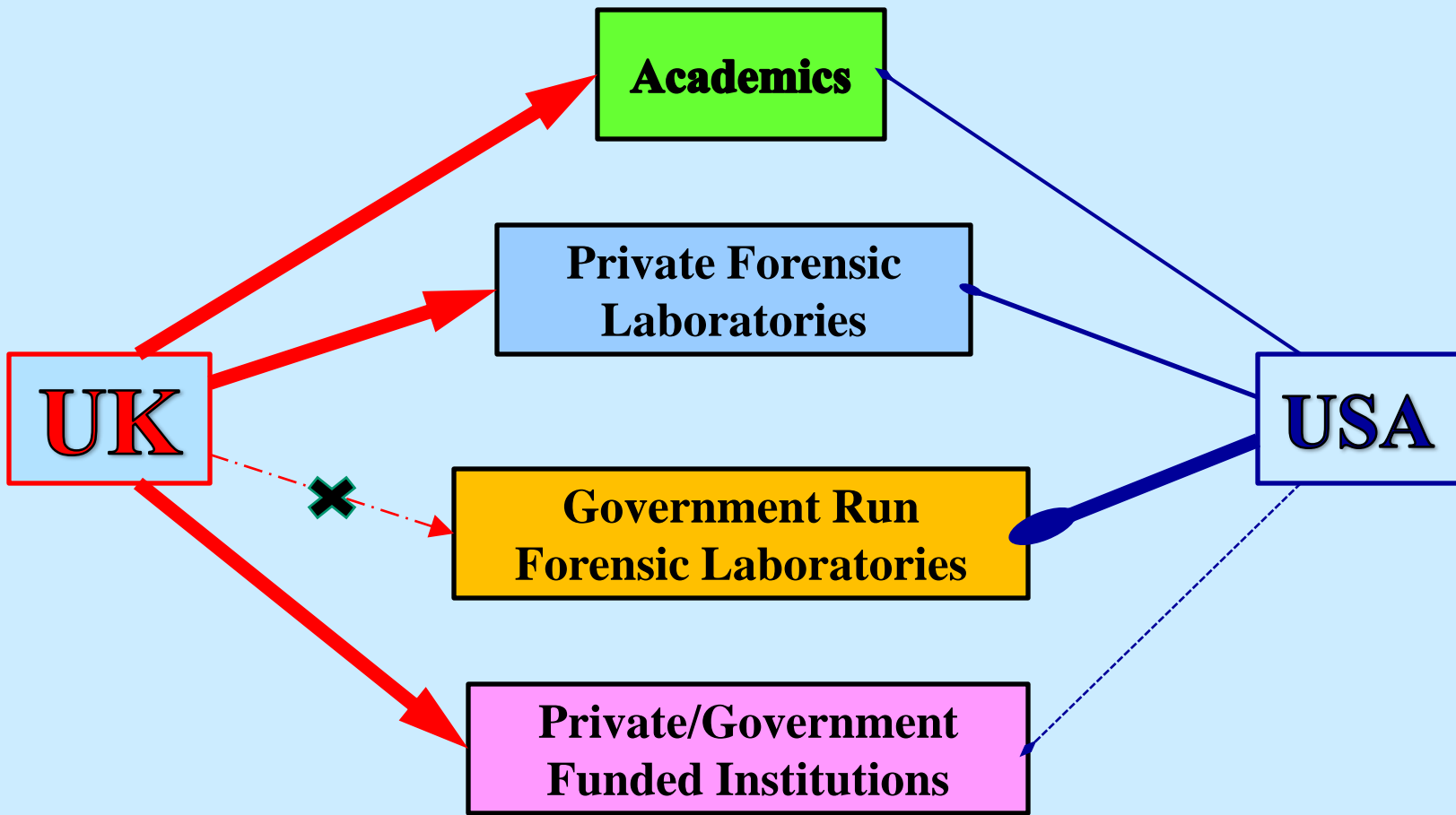
Privatization of forensic laboratories in the U.K. has:

- Increased the cooperation between academic institutions and the forensic community.
- Increased the number of institutions (both private and academic) interested in pursuing forensic geoscience research.
- Allowed for more funding and time to pursue research in forensic geosciences in academic settings that have more research oriented resources available.
- Created issues with quality control of work products

Study Conclusions (Cont'd)

Forensic laboratories in the United States face different challenges that have precluded the development of forensic geosciences including:

- Dependency on limited public funds which can vary from year to year
- The concentration of limited monetary and workload resources on DNA analyses and databases
- The closing of Trace Evidence Units/or their consolidation
- Inundation with casework and not enough analysts



...and now for something completely different....



2010 and 2011 Recent Developments

- 2010 3rd International Soil Forensics Conference
- The IUGS Initiative

2010 International Soil Conference – Long Beach, California

- 12 Nations were represented including delegates from:
 - Australia
 - Canada
 - Colombia
 - Netherlands
 - Germany
 - UK
 - United Arab Emirates
 - United States

Presentation Highlights

- Forensic Geosciences and the NAS Report
- QEMSCAN applications to Forensic Geoscience
- XRF applications for soil provenance studies
- Biomarkers to distinguish soils in urban areas
- Soil sampling strategies using spatial data analysis
- New applications of old mineral exploration techniques and use of various map and image tools to locate buried bodies.
- Locating buried bodies via examination of chemical processes in soils occurring during decomposition.
- Case studies and historical perspectives

SWGCEO

- A proposed Scientific Working Group for Forensic Geoscience
- Facilitators: Chris Taylor - US Army Lab and Bill Schneck - Washington State Patrol
- First informal gathering was a luncheon at 2010 Soil Forensics Conference in Long Beach, California



IUGS Initiative on Forensic Geology

- International Union of Geological Sciences (IUGS):
 - Non-governmental scientific organization.
 - Supports and facilitates international and interdisciplinary cooperation in geology.

Initiative on Forensic Geology (IFG)



- Initiative status:
 - Highest level for an international working group affiliate of the IUGS
 - Provides the Forensic Geology discipline with global status and funding
- The IFG was established in 2011 due to the efforts of Laurance Donnelly of the UK

IFG Officers

NAME	OFFICE	COUNTRY
Laurance Donnelly	Chair	UK
Rob Fitzpatrick	Vice Chair	Australia
Duncan Pirrie	Treasurer	UK
Marianne Stam	Secretary	USA
Elisa Bergslien	Web Designer	USA
Jan Mahoney	Web Master	Australia
Mark Harrison	Geoforensic Law Enforcement Advisor	Australia
Lorna Dawson	Communication	Scotland
Alastair Ruffell	Training and Publications	Northern Ireland
Skip Palenik	Geological (Trace) Evidence Advisor	USA
Chris Palenik	Geological (Trace) Evidence Advisor	USA
Raymond Murray	Honorary Committee Member	USA

IFG Regional Officers

NAME	REGION
Ahmed Saeed Al Kaabi	Middle East
Rosa Maria Di Maggio	Europe
Roger Dixon	Africa
Shari Forbes	Canada
Carlos Martin Molina Gallego	Latin America
Olga Gradusova Ekaterina Nesterina	Russia
James Robertson	Australia and Pacific
Bill Schneck	USA
Ritsuko Sugita	Japan and Asia

Prospective Goals and Objectives

- To promote Forensic Geology around the world
- Provide Forensic Geology training, out-reach and dissemination of Forensic Geology related information world wide
- Establish best practices guidelines.

Website: <http://forensicgeologyinternational.org/>

Upcoming Events in Forensic Geology

➤ 2011:



IUGS-FGI Inaugural Committee Meeting – Rome.

➤ 2012:



International Geological Congress – Brisbane



4th International Conference on Criminal and Environmental
Soil Forensics – the Netherlands



Forensic Soils Workshop – AAFS, Atlanta

A photograph of three fluffy, grey penguin chicks standing in a row. They have black heads with white patches around their eyes and black beaks. The chick on the left has a blue thought bubble above it. In the background, the legs and feet of adult penguins are visible, including one with a prominent yellow patch on its back.

Not
“DIRT”
again?!!!