

## Charles S. Tumosa, Ph.D.

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### Education:

Ph.D. in Chemistry (1972) from Virginia Polytechnic Institute and State University in Blacksburg, VA.  
B.S. in Chemistry (1966) from St. Joseph's College in Philadelphia, PA.

Nine undergraduate and graduate courses in business were taken at St. Joseph's University, Philadelphia from 1979-1982. An additional 12 course modules in Administration were taken in the City of Philadelphia Training and Development Executive Program, 1979 -1989.

### Professional Experience:

From January 2007 – Present: Adjunct Professor, later, Assistant Professor, University of Baltimore, Division of Criminology, Criminal Justice, and Forensic Studies; Forensic Studies Program, Baltimore MD 21201.

Taught undergraduate *Instrumental Analysis* and *Trace Evidence* for the University of Baltimore at the Baltimore Police Department Laboratory and introduced, on campus, a new course, *Forensics and Art* in Fall 2008.

From May 1994 – January 2006: Senior Research Chemist, Conservation Analytical Laboratory (CAL) now, Smithsonian Center for Materials Research and Education (SCMRE), Smithsonian Institution, Washington DC 20560

Investigation and characterization of cultural objects, both modern and ancient. Research has been conducted into their mechanical, physical, and chemical properties. The effects of temperature and relative humidity on simple and composite objects have been determined and the composite behavior modeled, generally the primary naturally occurring structural polymers; cellulose, collagen (gelatin), chitin and keratin, either alone or in composite structures. These studies have been expanded to non-museum applications. The long term (100s of yrs) behavior of materials is only now becoming appreciated. The effects of conservation treatments on objects could be tested and quantified as well. Oxidation and hydrolysis mechanisms of cellulose, lipids and proteins were also considered and their effect on structural behavior investigated. Cellulose degradation, both mechanical and chemical was studied on papyrus, paper, newsprint, linen and wood. The effects of solvents, moisture and temperature on the materials found in museum objects also have implications on the effects of conservation treatments.

Analyses were performed on historic and archaeological specimens to identify their structure, origin and condition. These have involved artifacts recovered from marine environments, including the preservation of mummies from cold environments, identification of trace materials from forensic cases and repatriation of remains from Vietnam.

Co-principal investigator of two Park Service Grants. One for developing and verifying a model for describing the mechanical properties of objects affected by environmental temperature changes and another to investigate the effects of oxidizing agents used to remediate chemical and biological warfare agents. Have acted as a consultant to other federal agencies on this subject.

From August 1995 to December 1996 detailed to the Office of Design and Construction to determine and write the standards for the environments of the facilities of the Smithsonian Institution. These results have been disseminated at the national and international levels.

Provided forensic support and information to other federal agencies and state jurisdictions.

Projects have included: the Star-Spangled Banner, murals at the Lincoln Memorial, the Statue of Columbia on the Capitol, the Enola Gay, the Dead Sea Scrolls, the numismatic and platinum items at Hillwood Museum (Washington DC); pre-Columbian gold and copper objects at the Dumbarton Oaks Collection, Lincoln's summer retreat in DC, etc.

Have taught numerous interns on various aspects of chemistry and materials testing, and have lectured at Johns Hopkins University in their Engineering program.

From August 1989 to May (August) 1994: Head of Analytical Services, Conservation Analytical Laboratory (CAL) renamed Smithsonian Center for Materials Research and Education (SCMRE), Smithsonian Institution, Washington DC 20560

This was a newly created supervisory position with three staff originally. Analytical Services conducts research into

the Analytical Chemistry of ancient and modern materials with the intent of gaining insight into the problems of Conservation, Anthropology, and the mechanisms of ancient technology. Administrative duties required the preparation of performance plans and performance appraisals for current staff as well as hiring new staff, including affirmative action initiatives. The position also required the evaluation of new technologies, recommending and purchasing new equipment. In addition, I was on the research proposal review board for scientific and archaeometric programs.

Techniques/equipment included were Scanning Electron Microscopy, X-ray Fluorescence techniques, Fourier Transform Infrared Spectroscopy, Gas chromatography, X-ray Diffraction, Light Microscopy, etc.

The laboratory was developed to analyze almost any object encountered in the museum environment. The laboratory and equipment were upgraded to meet this task; there were upgrades to the X-ray fluorescence data output, a computer and stepper upgrade to the x-ray diffractometer and the acquisition of a xeroradiographic unit (by donation) and the purchase of a new polarized light microscope. Work output was increased to over 5500 analyses per year. Analyses were performed for the Smithsonian Institution and other museums as well as other federal agencies.

Typical analyses included the identification of corrosion products, testing of suitability of exhibit and storage materials for museum use, examination of archaeological materials for technology and identification. Analyses were performed on thousands of museum and archaeological items.

Training was provided to interns and visiting staff and lecturing was provided for various aspects of the CAL training courses and seminars.

From June 1972 to August 1989: Supervisor (manager) of the Criminalistics Laboratory, Philadelphia Police Dept. Philadelphia, PA. 19106

Supervisory/managerial position with a technical staff of 10 and an administrative staff of 2 (directly, several others indirectly), investigating materials associated with the legal questions surrounding crimes of violence (excluding drug analyses), environmental hazards as well as materials testing for various City Agencies. The position required that a budget be prepared and equipment and supplies ordered within that budget. Performance plans and work assignments were prepared for staff and performance appraisals given.

Equipment purchased and used in the laboratory were a Scanning Electron Microscope with Energy Dispersive Spectroscopy, X-Radiograph, gas chromatograph, GC-MS, electrophoresis chambers and power supplies, light microscopes, etc. The primary emphasis of casework was the identification and characterization of trace materials including; blood, hair, glass, inks, paints, polymeric materials, explosive residues, arson residues etc. This information was then used to reconstruct events surrounding the incident.

"Expert" testimony was provided in criminal and civil cases as needed, court testimony was delivered in hundreds of cases in various jurisdictions, Federal and local. I served as an information resource to various City agencies in addition to technical support.

The Laboratory was developed from two technicians and limited equipment in 1971 to a state-of-the-art laboratory which by 1989 included a DNA sequencer and PCR cyclers as well as an SEM-EDS system. Equipment purchases were sustained by grant writing (NILECJ) and by direct proposals to City Government.

The laboratory was "full service" with a work output of over 60,000 analyses per year on over 20,000 objects (excluding drug analyses) with thousands of reports written.

Training of police personnel included all police recruits as well as detectives and new supervisors (Cpl.s and above). A sexual assault lecture series was developed with Women Organized against Rape for emergency room personnel at local hospitals. A similar program was developed for residents rotating through Children's Hospital, Philadelphia.

Interns and trainees from various agencies (including federal) were trained under my direct supervision. Lectured and taught at various universities and colleges including: LaSalle University, Community College of Philadelphia, Temple University, Lehigh Valley Community College, University of Pennsylvania etc.

Departmental commendations included Unit citations and personal citations for technical innovation.

From November 22, 1971 to June 1972: Chemist, Criminalistics Laboratory, Philadelphia PA Police Dept. (see above)

Promotion to supervisory position required a 6 month employment probationary period. This position was a staff position in the Criminalistics laboratory.

**Professional Affiliations:**

American Chemical Society  
 American Academy of Forensic Sciences  
 Mid-Atlantic Association of Forensic Scientists  
 Phi Lambda Upsilon (National Chemical Honors Society)

**Publications:**

- Tumosa, C. S., “Forensic Accounting” and “Forensic Science” in “Mafia”, Millennium House Press, Elanora Heights, Australia (2009) [in preparation].
- Tumosa, C. S., “Russian Platinum Metal Technology in the 19<sup>th</sup> Century: Chemistry and behavior of the platinum metal used in coinage”, *Journal of the Russian Numismatic Society* No. 87 (2009) 29-38.
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Tumosa, C. S., “A potential source of difficulty in the initial testing for blood”, *Forensic Science Communications* October (2004) [e-journal].

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