SPECIAL COMMUNICATION

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Charles C. Fulton (1900-1992), Microcrystal Test Pioneer

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ABSTRACT: Charles C. Fulton was a pioneer in the development of non-aqueous media for microcrystal tests for drugs. His career commenced in the "Untouchable" era of Prohibition and his record of publications began when forensic science literature as such was non-existent. His efforts in drug identification lead him to develop many new reagent media, keep pace with the rapidly expanding number of drugs in the post-war era, and contribute his science to combatting international drug trade by identifying opium sources for the newly created United Nations Secretariat. He authored Modern Microcrystal Tests for Drugs, a text still used in many forensic science laboratories, in 1969, before retiring to pursue eclectic interests including publishing on archeoastronomy, particularly of the Maya.

With great regret, I report the passing, on November 4, 1992, of Charles Clarke Fulton. Although not a member of the American Academy of Forensic Sciences, nor, so far as I have been able to research, any of the regional societies, Mr. Fulton, author of Modern Microcrystal Tests for Drugs and pioneer in the development of non-aqueous microcrystal test reagents, contributed much to forensic sciences.

Mr. Fulton was born on January 22, 1900 in Fairfield, Iowa, the son of Charles J. Fulton, an Iowa State Senator. He graduated with a baccalaureate degree from the Massachusetts Institute of Technology in 1922 with course work concentrated in chemistry and philosophy. For those of us for whom "Prohibition" is strictly an historical event, it is amazing to realize Mr. Fulton's career in the forensic sciences began in 1924 with a position as chemist for the US Department of the Treasury's Bureau of Prohibition, in Omaha, Nebraska. His work in both the identification of controlled substances and illicitly produced alcohol lead to acquaintances with H. J. Anslinger, Commissioner of the U.S. Bureau of Narcotics,[1] and members of the famous "Untouchables" group of Treasury agents. His first publication, "Some New and Improved Tests for Morphine and Related Alkaloids" appeared in the *Journal of Laboratory and Clinical Medicine* in 1928. He served with the Treasury Department's Alcohol Tax Unit and Bureau of Industrial Alcohol, in Minneapolis, St. Paul, and Chicago, publishing over 25 articles on

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both microcrystal and color tests for drugs in clinical chemistry and pharmacy journals, there being in effect no forensic science literature as such. At the time of his first 'retirement' in 1948, he had published articles on the identification of morphine, atropine, cocaine, procaine, heroin, pseudomorphine, opium alkaloids, cinchona alkaloids, Dilaudid, and alkaloids generally. He joined the Division of Narcotic Drugs within the newly formed United Nations Secretariat in 1948. His work on both problems of international drug controls and the identification of new synthetic drugs, such as methadon [sic] and Demerol, continued for ten years, during which he authored a number of articles for UN publications such as the *U.N. Bulletin on Narcotics.*

He returned to Federal service with the US Food and Drug Administration in 1958, publishing tests for colchicine in the *Journal of the Association of Official Agricultural Chemists* and contributing 10 sections to the *Encyclopedia of Microscopy*, including those on chemical microcrystal identifications, forms of microcrystals, origin of opium, purpose of chemical microscopy, reagents for microcrystal identifications, sympathomimetics and central stimulants, microcrystal tests for differentiating O^3-monoacetylmorphine, and O^6-monoacetylmorphine, diacetylmorphine, morphine, and codeine.

Mr. Fulton served under Dr. Milton Helpern, Chief Medical Examiner of the City of New York and one of the founders of the Academy, publishing in Dr. Helpern's *International Microfilm Journal of Legal Medicine* and was with the New Jersey State Medical Examiner's Office at the time he completed Modern Microcrystal Tests for Drugs,[2] contributed to *Acta Pharmaceutica Jugoslavica*, and authored the chapter on Microcrystal Tests in Handbook of Analytical Toxicology.

Mr. Fulton retired again in 1970, allowing him additional time to pursue eclectic interests including perfumery, raising exotic animals, mushroom hunting, and butterfly collecting. He continued to publish, authoring "Chemical Microcrystal Identifications" in the Encyclopedia of Microscopy & Microtechnique, and penning several articles on Maya architecture, arithmetic, and astronomy. Following the passing of his second wife in 1978, he returned to Minneapolis to live with his son and daughter-in-law, Eugene and Mary Ellen Fulton, in whose home he resided at the time of his death.

Mr. Fulton was a strong advocate of the notion that while the physical instrument of a microscope was used to reduce the quantity of substances needed to effect an identification, microcrystal tests were and ARE chemical methods of identifying chemical substances. Analysis by instrumental methods which identify chemical substances based on their physical properties have their place, but for those not content to be, as E. G. C. Clarke put it in the forward to Modern Microcrystal Tests, "a machine minder," microcrystal tests present a rapid, inexpensive, time-tested method of identification with a solid place in the armory of the criminalist.

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References

[1] Heath, H. B., "A Chronicle of Federal Drug Law Enforcement," *Drug Enforcement*, Vol. 7, No. 2, Dec., 1980, p. 24.

[2] Fulton, C. C., Modern Microcrystal Tests for Drugs, Wiley-Interscience, New York, NY, 1969.

Bibliography

[1] Fulton, C. C., "Some New and Improved Tests for Morphine and Related Alkaloids," *Journal of Laboratory and Clinical Medicine*, Vol. 13, No. 8, 1928, pp. 750–765.

[2] Fulton, C. C., "Some Color Reactions of Morphine and Its Derivatives on Heating in Concentrated Sulfuric Acid Solution," *Journal of Laboratory and Clinical Medicine*, Vol. 14, No. 1, 1929, pp. 13–29.

[3] Fulton, C. C., "The Identification of Atropine with Wagner's Reagent," *Journal of the Association of Agricultural Chemists*, Vol. 12, No. 3, March 1929, pp. 312–317.

[4] Fulton, C. C., "Aldehyde-Oxidation Reactions for Phenols, Particularly the Opium Alkaloids," *Journal of the Association of Official Agricultural Chemists*, Vol. 12, No. 4, April 1929, pp. 434–441.

[5] Fulton, C. C., "The Identification of Alkaloids by Precipitation," *Journal of the Association of Official* 497.

[6] Fulton, C. C., "The Precipitating Agents for Alkaloids," *American Journal of Pharmacy*, Vol. 104, No. 4, April 1932, pp. 244–271.

[7] Fulton, C. C., "A Test for Phenols and Copper," *American Journal of Pharmacy*, Vol. 105, No. 1, Jan. 1933, p. 25–29.

[8] Fulton, C. C., *American Journal of Pharmacy*, Vol. 105, 1933, p. 103.

[9] Fulton, C. C., "The Identification of Cocaine and Novocaine," *American Journal of Pharmacy*, Vol. 105, No. 7, July 1933, pp. 326–339.

[10] Fulton, C. C., "The Identification of Cocaine and Novocaine," *American Journal of Pharmacy*, Vol. 105, No. 8, Aug. 1933, pp. 374–379.

[11] Williams, G. D. and C. C. Fulton, "The Microscopic Identification of Heroine [sic]," *American Journal of Pharmacy*, Vol. 105, No. 9, Sept. 1933, pp. 436–440.

[12] Fulton, C. C., "The Production of Pseudomorphine from Morphine," *American Journal of Pharmacy*, Vol. 105, 1933, pp. 503–510.

[13] Fulton, C. C., *American Journal of Pharmacy*, Vol. 105, 1933. p. 511.

[14] Fulton, C. C., *Zeitscurift fuer Analytische. Chemie*, Vol. 99, 1934, p. 382.

[15] Fulton, C. C., "The Principal Chemical Tests for Morphine," *American Journal of Pharmacy*, Vol. 109, No. 5, May 1937, pp. 219–240.

[16] Fulton, C. C., *Journal of the American Pharmacy Association, Science Education*, Vol. 26., 1937, p. 726.

[17] Fulton, C. C., "Frohde's Reagent: A Reagent for Morphine and Other Phenolic Compounds," *Journal of Laboratory and Clinical Medicine*, Vol. 23, 1937, pp. 625–630.

[18] Fulton, C. C., "Crystal Tests for Minute Amounts of Morphine," *Journal of Laboratory and Clinical Medicine*, Vol. 23, 1938, pp. 622–625.

[19] Fulton, C. C., "Alkaloids and Their Reagents," *American Journal of Pharmacy*, Vol. 111, No. 5, May 1939, pp. 184–192.

[20] Fulton, C. C., "New Precipitating Agents for Alkaloids and Amines," *American Journal of Pharmacy*, Vol. 112, No. 2, Feb. 1940, pp. 51–64.

[21] Fulton, C. C., "New Precipitating Agents for Alkaloids and Amines," *American Journal of Pharmacy*, Vol. 112, No. 4, April 1940, pp. 134–154.

[22] Fulton, C. C., "Iodosulfate Microchemical Identification Tests for Cinchona Alkaloids," *Industrial and Engineering Chemistry, Analytical Edition*, Vol. 13, 1941, pp. 848–850.

[23] Fulton, C. C. and Dalton, J. B., "Microcrystal Identification Tests for Morphine, Heroin, and Dilaudid, and Cocaine," *Journal of Criminal Law and Criminology*, Vol. 32, No. 3, Sept.-Oct. 1941, pp. 358–365.

[24] Fulton, C. C., "Relation of Alkaloidal Chemistry to Inorganic, and the Use of Bromauric Acid as a Reagent for Inorganic Microcrystal Tests," *Journal of the American Pharmaceutical Association, Scientific Edition*, Vol. 31, No. 5, May 1942, pp. 177–182.

[25] Fulton, C. C., "Notes on Micro-Crystal Tests for Alkaloids and Amines Chiefly in Aqueous Solution, unpublished, 3rd ed., Sept. 1942.

[26] Fulton, C. C., *Industrial and Engineering Chemistry, Analytical Edition*, Vol. 14, 1942, p. 407.

[27] Fulton, C. C., "The Opium Poppy and Other Poppies," U.S. Treasury Department, Bureau of Narcotics, Washington, D.C., 1944.

[28] Fulton, C. C., "Identification of Methadon [sic] by Microcrystals," United Nations document E/CN.7/117, pp. 17–31, (27 Feb. 1948?) 14 April 1948.

[29] Fulton, C. C., "Opium Alkaloids - Narceine," United Nations document E/CN.7/117, 1948.

[30] Fulton, C. C., "Opium Alkaloids - Thebaine," United Nations document E/CN.7/117, 1948.

[31] Fulton, C. C. "Opium Alkaloids - Codeine," United Nations document E/CN.7/117/Add. 2, 22 September 1948.

[32] Fulton, C. C. "Microcrystal Reagents for the Direct Application to Dry Narcotic Demerol," unpublished data, 11 December 1949.
[33] Fulton, C. C., "The Analysis of Heroin," *U.N. Bulletin on Narcotics*, Vol. 5, No. 2, 1953, pp. 27–34.
[34] Fulton, C. C., "Some Microcrystal Testy for Colchicine," *Journal of the Association of Official Agricultural Chemists*, Vol. 41, 1958, pp. 756–758.
[35] Fulton, C. C., "Qualitative Tests for Drugs," *Journal of the Association of Official Analytical Chemists*, Vol. 43, No. 2, Feb. 1960, pp. 262–271.
[36] Fulton, C. C., "Alkaloids and Alkaloidal-Type Precipitation," *Encyclopedia of Microscopy*, ed. George L. Clark, Reinhold Publishing Corp., New York, NY, 1961, pp. 13–20.
[37] Fulton, C. C., "Chemical Microcrystal Identifications," *Encyclopedia of Microscopy*, George L. Clark, Ed., Reinhold Publishing Corp., New York, NY, 1961, pp. 20–37.
[38] Fulton, C. C., "Forms of Microcrystals," *Encyclopedia of Microscopy*, George L. Clark, Ed., Reinhold Publishing Corp., New York, NY, 1961, pp. 37–38.
[39] Fulton, C. C., "History (of Chemical Microscopy)," *Encyclopedia of Microscopy*, George L. Clark, Ed., Reinhold Publishing Corp., New York, NY, 1961, pp. 38–42.
[40] Fulton, C. C., "Nitrogen-Bonded Radicals: Identification," *Encyclopedia of Microscopy*, George L. Clark, Ed., Reinhold Publishing Corp., New York, NY, 1961, pp. 46–51.
[41] Fulton, C. C., "Observing Microcrystals," *Encyclopedia of Microscopy*, George L. Clark, Ed., Reinhold Publishing Corp., New York, NY, 1961, pp. 51–55.
[42] Fulton, C. C., "Origin of Opium," *Encyclopedia of Microscopy*, George L. Clark, Ed., Reinhold Publishing Corp., New York, NY, 1961, pp. 55–56.
[43] Fulton, C. C., "Purpose (of Chemical Microscopy)," *Encyclopedia of Microscopy*, George L. Clark, Ed., Reinhold Publishing Corp., New York, NY, 1961, pp. 56–57.
[44] Fulton, C. C., "Reagents for Microcrystal Identifications," *Encyclopedia of Microscopy*, George L. Clark, Ed., Reinhold Publishing Corp., New York, NY, 1961, pp. 58–65.
[45] Fulton, C. C., "Sympathomimetics and Central Stimulants," *Encyclopedia of Microscopy*, George L. Clark, Ed., Reinhold Publishing Corp., New York, NY, 1961, pp. 65–72.
[46] Fulton, C. C., "Microcrystal Tests for O^3-Monoacetylmorphine in Comparison with O^6-Monoacetylmorphine, Diacetylmorphine, Morphine, and Codeine," *Microchemical Journal*, Vol. 6, No. 1, 1962, pp. 51–65.
[47] Fulton, C. C., "An Analytical Study of Confiscated Samples of Narcotic Drugs," *International Microfilm Journal of Legal Medicine*, Vol. 1, No. 1, 1965, Card 2, G-1.
[48] Fulton, C. C., "Opium" (in part), *Encyclopedia Britannica*, Chicago, IL, Vol. 16, 1965, pp. 992–994.
[49] Fulton, C. C., "A Microcrystal Identification Test for Many Basic Drugs," *Acta Pharmaceutica Jugoslavica*, Vol. 19, No. 4, 1969, pp. 162–172.
[50] Fulton, C. C., *Modern Microcrystal Tests for Drugs*, Wiley-Interscience, New York, NY, 1969.
[51] Fulton, C. C., "Microcrystal Tests," *Handbook of Analytical Toxicology*, I. Sunshine, Ed., Chemical Rubber Co. Press, Cleveland, OH, 1969, pp. 461–496.
[52] Fulton, C. C., "The Furfural Test for Cannabis Resin," *U.N. Bulletin on Narcotics*, Vol. 22, No. 2, 1970, p. 33.
[53] Fulton, C. C., "Microcrystal and Other Convenient Tests for Rapid Recognition and Identification of Drugs," *Acta Pharmaceutica Jugoslavica*, Vol. 20, No. 4, 1970, pp. 159–170.
[54] Fulton, C. C., "Chemical Microcrystal Identifications," *Encyclopedia of Microscopy and Microtechnique*, P. Gray, Ed., Van Nostrand Reinhold Co., New York, NY, 1973, pp. 71–74.

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