

MEMORIAL OF ROGER CLARK WELLS

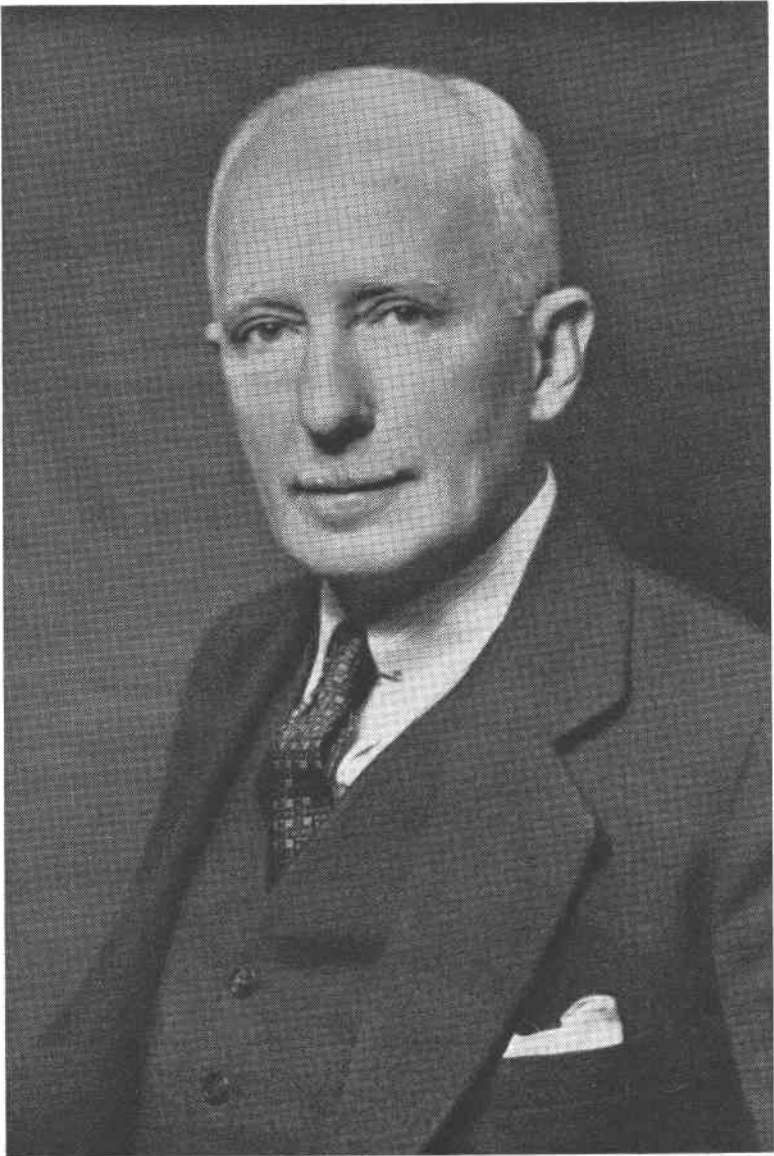
WALDEMAR T. SCHALLER, *U. S. Geological Survey, Washington, D. C.*

Roger Clark Wells, third Chief Chemist of the United States Geological Survey, died suddenly from a heart attack early in the morning of April 19, 1944, in the same hospital, where 10 hours earlier his predecessor, former Chief Chemist George Steiger had passed away. His death was most unexpected. I saw him the preceding Sunday; he looked very tired but he was cheerful and energetic, as always. No one thought the end was so close.

Dr. Wells was born at Peterboro, New York, October 24, 1877, son of Byron Wells and Lucy (Clark) Wells. He graduated from Harvard in 1901 and received his doctorate there three years later, working on the atomic weights of sodium and of chlorine, under Professor T. W. Richards. This early training in exact analytical chemistry is reflected in all his later analyses, all done with meticulous attention to accuracy. After holding instructorships at Harvard and Pennsylvania, and a year as research chemist with the General Electric Company, he was appointed physical chemist on the Geological Survey in 1908, becoming Chief Chemist in 1930.

Probably because of his early work on the atomic weight of sodium, he always retained a strong interest in that element and became Mineral Resources specialist on soda and sodium compounds. Later, with R. E. Stevens, he developed methods for the separation and determination of the rare alkalis.

His contact with the mineralogical work of the Survey evoked a strong interest in the chemical composition of minerals, especially those containing the less common elements, such as columbium, tantalum, zirconium, uranium, thorium, the rare earths, and the rare alkalis. His analysis of strüverite (bibliogr. no. 16) from South Dakota served as an introduction to the difficulty of analyzing minerals containing columbium, tantalum, and titanium and he carried out a vast number of researches into methods, before he was satisfied with the results. The atomic disintegration of uranium and the resultant products, and the application of the lead uranium ratio as a means of calculating the age of the earth, fascinated him and he served on the National Research Council, Division of Geology and Geography, Committee on Measurement of Geologic Time, for several decades. In the Council, he also served on the Committee on Sedimentation from 1919 to 1935 and on the Committee on Processes of Ore Deposition from 1928 to 1935. In 1916 he examined potash deposits in Chile and in 1920 he was a delegate to the First Pan-Pacific Scientific Congress in Honolulu.



ROGER CLARK WELLS
1877-1944

His office copies of the standard text books—those on analytical chemistry, Dana's Mineralogies, Clarke's Data of Geochemistry—are full of his written comments, notes in the text, on the margins, and on small slips of paper pasted in. His sets of his own publications, likewise, are full of such amending notes and comments, for he was ever anxious to have the latest and best data possible. These publications, with his written-in notes, are among the Chemical Laboratory's most cherished possessions.

Wells was co-author of the papers describing the new minerals loretoite, creedite, tungstenite, and brannerite, and he contributed many careful analyses of other minerals of complex composition.

Dr. Wells was a member of many scientific societies, among them the Washington Academy of Sciences in which he served as vice-president in 1923 and 1938. He was President of both the Washington Section of the American Chemical Society and the Geological Society of Washington. He also was a member of the American Institute of Mining and Metallurgical Engineers, and a Fellow of the American Association for the Advancement of Science, the Geological Society of America, and the Mineralogical Society of America. He was a member and former Elder of the Chevy Chase Presbyterian Church, and belonged to the Cosmos and Harvard Clubs of Washington and the Chevy Chase Citizens Association.

The administration of an increased chemical staff, with urgent war demands for a greatly increased output, placed a heavy burden on him in recent years. Yet, he remained the same kindly, cheerful, and conscientious leader, with no indication to his associates of the strain under which he was working. Ill but a week, his sudden death is a reflection of that strain.

In 1914 he married Etta May Card of Syracuse, New York, who, with two sons, Arthur Byron Wells and Roger Clark Wells, both in the service, survive him.

BIBLIOGRAPHY

- The transition temperature of sodium sulfate referred anew to the International Standard (with Richards, T. W.): *Proc. Am. Acad. Arts. Sci.*, **38**, 431-440 (1902).
- The nephelometer, an instrument for the detection and estimation of opalescent precipitates (with Richards, T. W.): *Am. Chem. Jour.*, **31**, 235-243 (1904).
- A revision of the atomic weights of sodium and chlorine (with Richards, T. W.): *Carnegie Institution, Pub.* **28**; *Jour. Am. Chem. Soc.*, **27**, 459-529 (1905); *Chem. News*, **93**, 175 (1906); *Zeit. anorg. Chem.*, **47**, 56-135 (1905).
- The estimation of opalescent silver chloride precipitates: *Am. Chem. Jour.*, **35**, 99-114 (1906).
- Note on "The estimation of opalescent silver chloride precipitates." *Am. Chem. Jour.*, **35**, 508-509 (1906).
- Equilibria in silver chloride solutions: *Jour. Phys. Chem.*, **10**, 79-92 (1906).
- The transition temperature of sodium bromide, a new fixed point in thermometry (with Richards, T. W.): *Proc. Am. Acad. Arts. Sci.*, **41**, 436-448 (1906).

- The phase relations of the system sodium carbonate and water (with McAdam, Jr., D. J.): *Jour. Am. Chem. Soc.*, **29**, 721-727 (1907).
- The instability of certain tungstates in water: *Jour. Am. Chem. Soc.*, **29**, 112-117 (1907).
- The nomenclature of hydrogen sulfide: *Jour. Am. Chem. Soc.*, **31**, 1283 (1909).
- The electrical conductivity of ferric sulfate solutions: *Jour. Am. Chem. Soc.*, **31**, 1028-1035 (1909).
- A new occurrence of hydrogiobertite: *Am. Jour. Sci.*, **30**, 189 (1910).
- The determination of thorium in monazite sand: *U. S. Geol. Survey, Mineral Resources*, 1909, Pt. II, 902 (1910).
- The fractional precipitation of sulphides: *Econ. Geol.*, **5**, 1-14 (1910).
- Criteria of secondary enrichment (discussion): *Econ. Geol.*, **5**, 479-484 (1910).
- An occurrence of strüverite (with Hess, F. L.): *Am. Jour. Sci.*, **31**, 432-442 (1911).
- The role of hydrolysis in geological chemistry: *Econ. Geol.*, **6**, 211-217 (1911).
- The fractional precipitation of carbonates: *Jour. Wash. Acad. Sci.*, **1**, 21 (1911).
- Sensitiveness of the colorimetric estimation of titanium: *Jour. Am. Chem. Soc.*, **33**, 504 (1911); *Zeit. anorg. Chem.*, **70**, 395-399 (1911).
- Mineral electrodes: *Trans. Am. Electro-chem. Soc.*, **22**, 313-318 (1912).
- Electrical potentials between conducting minerals and solutions: *Jour. Wash. Acad. Sci.*, **2**, 514-516 (1912).
- Electrochemical activity between solutions and ores: *Econ. Geol.*, **8**, 571-577 (1913).
- A new occurrence of cuprodesclowitzite: *Am. Jour. Sci.*, [4], **36**, 636-638 (1913).
- The interpretation of mineral analyses: *Jour. Wash. Acad. Sci.*, **3**, 416-423 (1913).
- Electric activity in ore deposits: *U. S. Geol. Survey, Bull.* **548** (1914).
- The electromotive behavior of soluble sulfides: *Jour. Phys. Chem.*, **18**, 510-520 (1914).
- The fractional precipitation of some ore-forming compounds at moderate temperatures: *U. S. Geol. Survey, Bull.* **609** (1915).
- The solubility of magnesium carbonate in natural waters: *Jour. Am. Chem. Soc.*, **37**, 1704-1707 (1915).
- The solubility of calcite in water in contact with the atmosphere, and its variation with temperature: *Jour. Wash. Acad. Sci.*, **5**, 617-622 (1915).
- Experiments on the extraction of potash from wyomingite: *U. S. Geol. Survey, Prof. Paper* **98-D**, (1916).
- Lorettoite, a new mineral (with Larsen, E. S.): *Jour. Wash. Acad. Sci.*, **6**, 669-672 (1916).
- Some minerals from the fluorite-barite vein near Wagon Wheel Gap, Colorado (with Larsen, E. S.): *Proc. Nat. Acad. Sci.*, **2**, 360-364 (1916).
- Tungstenite, a new mineral (with Butler, B. S.): *Jour. Wash. Acad. Sci.*, **7**, 596-599 (1917).
- The extraction of potassium salts from Pintados Salas: *Eng. Mining Jour.*, **105**, 678-679 (1918).
- New determinations of carbon dioxide in water of the Gulf of Mexico: *U. S. Geol. Survey, Prof. Paper* **120-A**, (1918).
- Solubility of calcite in sea-water in contact with the atmosphere and its variation with temperature: *Carnegie Inst. Pub.* **213**, 316-318 (1918).
- Sodium salts in 1917: *U. S. Geol. Survey, Mineral Resources*, 1917, 305-341 (1919).
- Sodium and sodium compounds in 1918: *U. S. Geol. Survey, Mineral Resources*, 1918, 159-198 (1919).
- Evaporation and concentration of waters associated with petroleum and natural gas (with van A. Mills, R.): *U. S. Geol. Survey, Bull.* **693**, (1919).
- Determinations of carbon dioxide in sea-water at Tortugas, Florida: Year Book 18, *Carnegie Inst. of Washington*, 195-196 (1920).

- Brannerite, a new uranium mineral (with Hess, F. L.): *Jour. Franklin Inst.*, **189**, 225–238 (1920).
- Note on brannerite: *Jour. Franklin Inst.*, June 1920.
- An unusual deposit of aragonite from sea-water: *Jour. Wash. Acad. Sci.*, **10**, 249 (1920).
- The salt error of cresol red: *Jour. Am. Chem. Soc.*, **42**, 2160 (1920).
- Sodium compounds in 1919: *U. S. Geol. Survey, Mineral Resources*, 1919, 47–79 (1920).
- Book review: Doelter's Festschrift. *Jour. Am. Chem. Soc.*, **43**, 381–382 (1921).
- Chemical and physical researches on sediments: *Report of subcommittee, Committee on Sedimentation, Division of Geology, National Research Council* (1921).
- Sodium compounds in 1920: *U. S. Geol. Survey, Mineral Resources*, 1920, 123–134 (1921).
- The alkalinity of Searles Lake brine: *Jour. Ind. Eng. Chem.*, **13**, 691 (1921).
- Some effects produced by common changes in natural waters: *Proc. First Pan-Pacific Scientific Congress, B. P. Bishop Museum Publication*, 630–634, (1921).
- Physico-chemical investigation of the water of the Pacific Ocean: *Proc. First Pan-Pacific Scientific Congress, B. P. Bishop Museum Publication*, 635–637 (1921).
- Note on the water of Borax Lake: *Jour. Wash. Acad. Sci.*, **11**, 477 (1921).
- Determination of silica in filtered sea-water: *Jour. Am. Chem. Soc.*, **44**, 2187 (1922).
- The carbon dioxide content of sea-water at Tortugas: *Carnegie Inst. of Washington Pub.* **312**, 87 (1922).
- Book review: Study of underground electrical prospecting. By C. Schlumberger. Gautier-Villars & Co., Paris, 1920. Trans. by S. F. Kelly. *Econ. Geol.*, **17**, 623 (1922).
- Sodium sulphate: its sources and uses: *U. S. Geol. Survey, Bull.* **717**, (1923).
- The alkalinity of sea-water: *Press Bulletin, U. S. Geol. Survey* (1924).
- Select bibliography of the literature dealing with the relation of radioactivity to geological problems: *National Research Council* (1924).
- Note on the Hicks method of determining potassium (with Bailey, R. K., and Fairchild, J. G.): *Ind. Eng. Chem.*, **16**, 935 (1924).
- Book review: Felix Cornu (A memorial volume). *Jour. Am. Chem. Soc.*, **46**, 2348 (1924).
- Reaction between ferrous salts and cuprous salts: *Am. Jour. Sci.*, [5], **8**, 428–433 (1924).
- Observations on the minor constituents of petroleum: *Econ. Geol.*, **20**, 286–288 (1925).
- Chemistry of the deposition of native copper from ascending solutions: *U. S. Geol. Survey, Bull.* **778** (1925).
- What is an element?: *Scientific Monthly*, June (1926).
- Age of minerals and rocks: *Press bulletin, U. S. Geol. Survey* (1926).
- Ages of minerals and rocks based on radioactive changes: *International Critical Tables*, **1**, 381 (1926).
- Book review: Tabellen zur Allgemeinen und speziellen Mineralogie. By Paul Niggli. *Ind. Eng. Chem.*, **19**, 653 (1927).
- Book review: Eminent chemists of our time. By Benjamin Harrow. Van Nostrand. *Ind. Eng. Chem.*, **19**, 859 (1927).
- Book review: Physico-Chemical Geology. By R. H. Rastall. *Jour. Am. Chem. Soc.*, **49**, 2338 (1927).
- The element "mosandrum" of J. Lawrence Smith: *Jour. Wash. Acad. Sci.*, **17**, 385 (1927).
- Examination of sulfuric acid for selenium: *Jour. Wash. Acad. Sci.*, **18**, 127 (1928).
- Note on the J. Lawrence Smith method for the analysis of samarskite: *Jour. Am. Chem. Soc.*, **50**, 1017 (1928).
- Book review: The Story of Geology. By Allen L. Benson. *Ind. Eng. Chem.*, **20**, 987 (1928).
- Evaporation from large bodies of water and some figures for Chesapeake Bay: *Jour. Wash. Acad. Sci.*, **18**, 461 (1928).
- Chemistry of the deposition of native copper from ascending solutions, a chapter in "The

- copper deposits of Michigan," by Butler, B. S., Burbank, W. S., and others. *U. S. Geol. Survey, Prof. Paper 144*, 137-142 (1929).
- Salinity of the water of Chesapeake Bay (with Bailey, R. K., and Henderson, E. P.): *U. S. Geol. Survey, Prof. Paper 154-C*, 105-152 (1929).
- Origin of helium-rich natural gas: *Jour. Wash. Acad. Sci.*, **19**, 321 (1929).
- Samarskite from Petaca, New Mexico (with Hess, F. L.): *Am. Jour. Sci.*, **19**, 17 (1930).
- The solubility of some rare-earth nitrates in ether: *Jour. Wash. Acad. Sci.*, **20**, 146 (1930).
- Uraninite from Placer-de-Guadalupe: *Am. Mineral.*, **15**, 470 (1930).
- The heat of solution of some potash minerals (with Richardson, L. T.): *Jour. Wash. Acad. Sci.*, **21**, 243 (1931).
- Government loses suit to compel employees to assign patents: *Ind. & Eng. Chem., News ed.* (1931).
- Industry's dependence on mineral products: *U. S. Daily*, July 9-10 (1931).
- Evaporation as a function of insolation (discussion): *A. Soc. Civil Eng., Trans.*, **95**, 1016 (1931).
- Further studies of kolm: *Jour. Wash. Acad. Sci.*, **21**, 409 (1931).
- The analysis and composition of fatty material produced by the decomposition of herring in sea water (with Erickson, E. T.): *Jour. Am. Chem. Soc.*, **55**, 338 (1933).
- Thorianite from Easton, Pa. (with Fairchild, J. G., and Ross, C. S.): *Am. Jour. Sci.*, [5], **26**, 45 (1933).
- Thorium minerals as age indicators: *Jour. Wash. Acad. Sci.*, **23**, 541 (1933).
- Allanite from Wyoming: *Am. Mineral.*, **19**, 81 (1934).
- The thermal decomposition of some carbonate minerals: *Trans. Am. Geophysical Union*, 15th Annual Meeting, 237 (1934).
- Determination of the common and rare alkalies in mineral analysis (with Stevens, R. E.): *Ind. Eng. Chem., Anal. Ed.*, **6**, 439-442 (1934).
- Tests of some chemical reagents for lead: National Research Council. *Report of the Committee on the measurement of geologic time*, 66-67 (1936).
- Some organic constituents of a recent sediment from Chincoteague Bay, Va. (with Erickson, E. T.): *U. S. Geol. Survey, Prof. Paper 186-d*, 69-79 (1937).
- Analyses of rocks and minerals from the laboratory of the U. S. Geol. Survey, 1914-1936: *U. S. Geol. Survey, Bull.* **878**, 134 pp. (1937).
- The analysis of pollucite: (with Stevens, R. E.): *Ind. Eng. Chem., Anal. Ed.*, **9**, 236 (1937).
- Sodium carbonate and sodium sulphate: *Industrial Minerals and Rocks*, 739-748 (1937).
- The origin of primary lead ores: *Econ. Geol.*, **33**, 216 (1938).
- Hans Kierstede of New Amsterdam: *Ind. Eng. Chem., News Ed.*, **16**, 477 (1938).
- Present trends in geochemistry: *Jour. Chem. Education*, **15**, 524-531 (1938).
- Luke Romme of Fabins, N. Y.: *N. Y. Historical and Genealogical Record*, Oct. (1939).
- Book review. Technical methods of ore analysis. By A. J. Weinig and W. P. Schoder. *Ind. Eng. Chem., News Ed.*, **17**, 642 (1939).
- Ceramic clay in Hawaii (with Wentworth, C. K., and Allen, V. T.): *Am. Mineral.*, **25**, 1-33 (1940).
- Book review: Temperature, its measurement and control in science and industry. *Bull. Am. Assoc. Petrol. Geol.*, **25**, 1416 (1941).
- Use of phosphate for separation of cobalt from iron (with North, Victor): *Ind. Eng. Chem., Anal. Ed.*, **14**, 859 (1942).
- The third dissociation constant of phosphoric acid and its variation with salt content: *Jour. Wash. Acad. Sci.*, **32**, 321 (1942).
- Determination of small amounts of molybdenum in tungsten and molybdenum ores (with Grimaldi, F. S.): *Ind. Eng. Chem., Anal. Ed.*, **15**, 315 (1943).
- Relative abundance of nickel in the earth's crust: *U. S. Geol. Survey, Prof. Paper*, 205-A (1943).