

Footnotes to *The History and Science of the Manhattan Project*

Last update: June 10, 2015

Abbreviations

H&A	Hewlett & Anderson
HAER	Historic American Engineering Record: B Reactor (105-B) Building, HAER No. WA-164. DOE/RL-2001-16; < http://wcpeace.org/history/Hanford/HAER_WA-164_B-Reactor.pdf >
HMMW	Hoddeson, Henriksen, Meade & Westfall

Phrases from the text appearing in these citations are to be taken as indicating general textual areas – from on the order of a sentence or two to a few pages – to which citations apply. Some citations are to sources which adopted material from other sources; these are included to cover a wide variety of sources that readers might have available. Microfilm images are cited in the format

microfilm set (reel), image number(s)

on the DVDs supplied to this author by the NARA. For example, M1392(1), 0296-0299 indicates NARA microfilm set M1392, reel 1, images 0296 through 0299. Publication years for books are not normally cited except for sake of clarity on specific edition used or if a number of books have been published by the same author. See the “Further Reading” list at the end of each chapter for a detailed bibliography for that chapter.

Special Note

As this book was going to press, the Department of Energy began posting the MDH online at <https://www.osti.gov/opennet/manhattan_district.jsp>. In particular, previously redacted material on the K-25 plant (Sect. 5.4) is now being made available.

Preface

- vii Casualty statistics: Jones 547; Rhodes 734
- vii Newseum story: www.newseum.org/centrury
- vii Most complex project: HHMW 23
- ix “One huge factory”: Rhodes 294

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- 1 Labor and cost statistics; dozen individuals: U.S. News & World Report **119**(5), 44-59, Jul. 31, 1995; H&A 723; Kelly (2007) 93

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- 19 Discovery of Polonium: Curie & Curie (1898)
- 20 Discovery of radium: Curie, Curie, & Bémont (1898)
- 20 Discovery of electrons: Thomson (1897)
- 21 Alpha and beta rays: Rutherford (1899)
- 21 Thorium emanation: Rutherford (1900)
- 21 Half-life: Rutherford (1902); Kragh <http://arxiv.org/abs/1202.0954>
- 25 100 calories/hour: Curie & Laborde (1903)
- 26 Twenty thousand times: Rutherford & Soddy (1903)
- 26 500-ton weight: Jenkin (2011) 130
- 27 Isotopes: Soddy (1913)
- 27 Mass spectroscopy: Squires (1998); Weinberg Ch. 3
- 28 Thomson mass spectrometer: Thomson (1907)
- 28 Neon and chlorine: Aston (1919 and 1920; 4 papers in *Nature* and *Phil. Mag.*)
- 30 Uranium 238: Aston (1931)
- 33 Alpha particles as helium nuclei: Rutherford & Royds (1909)
- 34 “15-inch shell”: Preston, p. 36, attributed to Chadwick
- 34 Geiger and Marsden (1909)
- 35 Rutherford nuclear model: Rutherford (1911)
- 35 Nucleus terminology: Nicholson (1911)
- 40 Beta-rays as electrons: Becquerel (1900; two papers in *Comptes Rendus*)
- 43 Hydrogen scintillations: Rutherford (1919)
- 47 Linear accelerator: Wideröe (1928)
- 48 Cyclotron: Lawrence & Edlefsen (1930); Lawrence & Sloan (1931); Lawrence & Livingston (1931); Cassidy Ch. 3
- 50 Neutron discovery: Bothe & Becker (1930); Curie & Joliot (1932); Chadwick (1932; two papers); Kuhn (1932); Frisch (1967); Brown (1997); Reed (2007)
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 59 Fermi neutron-induced radioactivity and transuranic elements discovery: Fermi (1934; two papers)
 61 13-minute activation: Fermi et al. (1934; *Proc. Roy. Soc.*)
 61 Ida Noddack: Noddack (1934). A translation by Graetzer is available at www.chemteam.info/Chem-History/Noddack-1934.html
 61 “Carping criticism”: Rhodes 231
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- 111 Begin search for element 94: Kathren et al. (1994) 12-14
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 126 Einstein to Sachs, Mar. 7, 1940: Sachs Exhibit 7a
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147 “An afterthought”: Smyth Sect. 5.7

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147 Murphree to Bush, Dec. 10, 1941, M1392(1), 0648 – 0652

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148 Bush to Compton, Lawrence, and Urey, Dec. 13, 9141, M1392(1), 0570 – 0581

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148 Compton to Bush, Conant, and Briggs, Dec. 20, 1941, M1392(1), 0862 – 0867

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149 Compton to Conant, Jan. 22, 1942, M1392(1), 0868 – 0871

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149 Conant report, Feb. 20, 1942, M1392(1), 0775 – 0781; Smyth Sect. 5.13

149 75-microgram samples: HHMW 28

149 Lawrence to Bush, Mar. 7, 1942, M1392(1), 0782; Lawrence to Conant, Mar. 13, 1942, M1392(1), 0783 – 0784; Lawrence to Conant, Mar. 26, 1942, M1392(1), 0790

150 Bush to Roosevelt, Mar. 9, 1942, M1392(1), 1007-1023

150 Reich Research Council: Rhodes 403

151 Roosevelt to Bush, Mar. 11, 1942, M1392(1), 0785

151 General Styer: M1392(1), 0788; H&A 72. Bundy’s memo refers to Styer as a Colonel, whereas Hewlett and Anderson and Jones have him as a Brigadier General

152 Conant to Bush, Apr. 1, 1942, M1392(1), 0791-0800

152 “Court of public opinion”: Conant to Bush, May 14, 1942, M1392(1), 0812 – 0814; Smyth Sect. 5.15

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153 Breit resignation: Breit to Briggs, May 18, 1942, M1392(1), 0817 – 0819; HHMW 27, 41

153 Conant to Bush, May 25, 1942, M1392(1), 0821 – 0825

154 Szilard to Bush, May 26, 1942, M1392(1), 0842 – 0843. Smyth Sects. 6.10 and 6.22 refutes Szilard’s claim that material of sufficient quantity was available so early in the project

154 Creutz to Bush, May 27, 1942, M1392(1), 0837 – 0838

154 Bush to Creutz, June 1, 1942, M1392(1), 0836; Bush to Szilard, June 1, 1942, M1392(1), 0840

154 Bush to Styer, June 11, 1942, M1392(1), 0844; Bush to Conant, June 11, 1942, M1392(1), 0845

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155 Fate of Col. Marshall: Norris 189, 615n8; Nichols 101, 114; Fine & Remington 681

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156 Groves responsibilities: Groves 3-4; Norris 161-162, 606n95, 611n42

156 Marshall diary: Norris 609n19; I am most grateful to Mr. Norris for providing me with a copy of Marshall’s diary

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- 157 Berkeley conference: HHMW 43; Hawkins 2 gives the time of the Berkeley conference as late June. Other participants included John van Vleck, Emil Konopinski, Stanley Frankel, Eldred Nelson, and Felix Bloch
- 157 Impurity issue: Smyth Sect. 12.2; HHMW 43-47
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- 162 Bohemian Grove meeting: HHMW 57; Compton 150-154. Compton gives the date as 15-16 September, different from all other sources. The minutes of the meeting can be found in M1392(9), 0077-0082, and confirm the September 13-14 dates
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- 163 Groves promotion: Norris 180
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- 164 Groves’ offices: Kelly 222; Norris 2-3, 560n3;
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- 165 “Better than our intrinsic abilities”: Kelly (2007) 122; Norris 235-6
- 165 Nichols on Groves: Nichols 108, cited in Norris 210
- 165 “In the soup”: Groves 20; Norris 178
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- 168 Greenewalt: Groves 52, 79; H&A 188; Compton 164; HHMW 36-38; Nichols 65

- 168 49 Project report: M1392, Roll 3, Target 4, Folder 17, “S-1 Technical Reports [1942-1944]”
- 169 Lewis report to Groves: Nichols 68
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- 170 January 4, 1943 contract: Jones 112; H&A 191; Compere 7
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- 170 29-page report to FDR: H&A 114-115; Nichols 69
- 171 “OK-FDR”: Bush to Roosevelt, Dec. 16, 1942 (amended Dec. 23), M1392(1), 0949-0951; Bush to Wallace, Stimson, and Marshall, Dec. 15, 1942, M1392(1), 1035-1063
- 172 British postwar commercial development: H&A 271
- 172 Roosevelt to Bush, Dec. 28, 1942, M1392(1), 0946
- 172 Conant and Tolman: Smyth Sects. 5.28 – 5.31; Groves 44
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331 “The effects could well be called unprecedented”: Hawkins 275; Groves 437-438; Norris 408

331 “The war is over”: Seidel 100

331 Fermi’s estimate of *Trinity* yield: http://www.lanl.gov/history/story.php?story_id=13; <http://www.atomicarchive.com/Docs/Trinity/Fermi.shtml>; HHMW 372

333 “A foul and awesome display”: http://www.lanl.gov/history/story.php?story_id=13; Bainbridge in Wilson 230

333 Bethe, Kistiakowsky and Bradbury descriptions of test in Los Alamos Historical Society 53, 54

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334 “Oppie, you owe me \$10”: Badash et al. 60

335 “July 1945 at Alamogordo”: Kelly (2007) 146

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338 “Discussed Manhattan”: Ferrell 30

338 “It resulted from the atomic fission”: Norris 408, 663n44

339 Truman informs Stalin of a new weapon: H&A 394; Szasz (1984) 147; McCullough 437, 442-443

339 Soviets knew of features of implosion bomb five months before test: Albright & Kunstel 121

339 Newspaper accounts of *Trinity*: Groves 301

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- 339 Soil samples indicate 18.6 kilotons: HHMW 374-376; Szasz (1984) 117
- 339 *Trinity* estimated yield 23.8 kt from 1952 analysis: F. Reines, “Yield of the Hiroshima Bomb,” Los Alamos report LA-1398 (April 18, 1952);
<http://www.fas.org/sgp/othergov/doe/lanl/la-1398.pdf>
- 339 Official *Trinity* yield listed at 21 kt: Coster-Mullen (2010) 41; United States Nuclear Tests July 1945 through September 1992. (U. S. Department of Energy, Nevada Operations Office, report DOE/NV-209 REV 15)
http://www.nv.doe.gov/library/publications/historical/DOENV_209_REV15.pdf
- 340 Fallout from *Trinity*: Szasz (1984) 115-117, 121
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