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JOHN LUCIAN SAVAGE

1879—1967

A Biographical Memoir by

ABEL WOLMAN AND W. H. LYLES

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BY ABEL WOLMAN AND W. H. LYLES

FOR SOME TIME "Jack" Savage and I (A.W.) served on the Board of Consultants to Israel on the Jordan River Development concerning the implementation of Israel's total water resources. Together we trudged the hills and deserts of that water-starved country in a relatively fruitless search for reliable dam sites and leak-proof reservoirs, once dodging a less-than-friendly geological structure that had fractured. Days of field exploration and office debate quickly became years, but Savage clung to the idea that somehow he would do the miraculous by waterproofing floors and sides. I was impressed throughout by his unfailing, quiet devotion to the task, by his extraordinary wealth of global experience, and by his gentle expertise and wisdom. None of us associated with "Jack" Savage are likely to forget him.

Savage, later known to some as "Jack Dam" for his outstanding work in civil engineering, was born on Christmas Day, 1879, at a farm near Cooksville, Wisconsin. The son of Edwin Parker and Mary Therese (Stebbins) Savage, he could claim a distinguished ancestry—his first paternal American ancestor was a John Savage who settled in Middletown, Connecticut, in 1652, and his father served in the Civil War with Company C, 40th Regiment, Wisconsin Volunteers—but he, his older brother, and his younger sister preferred instead to think simply

of their "kind, thoughtful, and understanding parents who controlled by quiet explanation and advice."*

Savage's early life typified boyhood adventures on a farm. Once his father instructed him to drive to a distant field and bring in the hay, but young Jack became so involved in a baseball game he forgot the chore until sunset, when instead he filled the wagon from a neighbor's stack. The incident, he remembered, "had a painful sequel the next day." On another occasion he broke all the windows in an empty neighboring house with his father's gift of a slingshot—one of his very few acts of destruction, I would guess.†

Constant work characterized Savage throughout his career, beginning in his earliest days when he performed farm chores between classes at a country grade school in Cooksville. Later, he earned board and tuition for two years at the Hillside Home School near Spring Green, where he was the only Latin scholar; then worked on a farm during the vacations of Madison High School, from which he graduated. In the vacation of his freshman year at the University of Wisconsin he did drafting work for the Geological Survey of Wisconsin; during the summer vacations of his sophomore and junior years he did instrumental surveying for the U.S. Geological Survey, including leveling and topographic (plane table) surveys. While at the university, he was admitted to the honorary fraternity Tau Beta Pi and was a member of the *Badger Annual* staff, in which publication he was characterized by the quotation, "Women are not of his sphere." Savage graduated with a B.S. in Civil Engineering in 1903, having enjoyed all his studies "except spelling,"‡ and was offered a teaching position at Purdue. Instead, he immediately joined the U.S. Reclamation Service, Idaho Division, as an engi-

*J. L. Savage, Autobiographical Statement, National Academy of Sciences, Washington, D.C., 1950, p. 1.

†*Current Biography 1943*, ed. Maxine Block (New York: H. W. Wilson Co., 1944), p. 665.

‡Savage, p. 1.

neering aide at sixty dollars a month, a post he would continue until June 1908.

He began work on the Minidoka project, across the Snake River, where he "was greeted . . . by an unseasonable snow, and his first sight of headquarters was a tent with a yellow smallpox flag in the sagebrush plain."* The men lived in tents, drinking river water and doing their own laundry if it seemed "really necessary,"† with an agreement to swim in the River at least once a month. When December arrived, the other men quickly paid their dues, but Savage "kept insisting the weather would break, and waited hopefully until the afternoon of the 31st. Then it was not only snowing, but much colder than it had been before. A huge and appreciative audience saw him streak into the water, do a double flip something like a seal, and alight on the bank with barely a pause."‡ But Savage realized the seriousness of the mission: "When I first went out to the Snake River Valley, I saw only a river, and a lot of wasteland. After the dam was up the land changed. It got water. Farmers moved in to work the soil. Crops grew. Then came villages and towns. That's why I think this is the happiest, most thrilling work in the world."§ He worked also on the Payette-Boise Canal System, the Boise River Diversion Dam, and the Upper and Lower Deer Flat dams—all satisfying projects.

In 1908 he left the Reclamation Service to begin an eight-year association with A. J. Wiley, a consulting engineer in Boise, in an engineering practice boomed by a water utilization program by private interests in the power and irrigation fields. "More than half my time," he later said, "was spent in the field on inspection and consultation problems,"‖ problems that in-

**John Fritz Medal: Biography of John Lucian Savage* (New York: Supplement to John Fritz Medal Book, 1945), p. 2.

†Joseph Phillips, "The Best Dam Man in the Business," *Colorado Wonderland* (December 1953): 36.

‡*Current Biography*, p. 666.

§Phillips, p. 36.

‖Savage, p. 1.

cluded the Salmon River Dam, the Swan Falls Power Plant on the Snake River, the Barber Dam on the Boise River, the Twin Falls North Side Canal System, and the American Falls Power Plant. Savage also designed the gates for the Arrowrock Dam on the Boise River, which as a part of the Boise River Project eventually converted 350,000 acres of wasteland into productive farmland. While in Idaho, Savage made his only business venture, a ranch, where he developed a herd of cattle that he enjoyed "looking at Sunday afternoons."*

But having considerably more interest in work than in money, he returned in June 1918 to the newly organized office of the chief engineer of the U.S. Bureau of Reclamation, where he became first designing engineer and then chief designing engineer in charge of all civil, electrical, and mechanical design, from 1924 to 1945. The chief engineer, Savage's supervisor, maintained for the most part a hands-off policy on engineering design, except when contractual or administrative problems arose, so Savage was responsible in his position for such projects as the Hoover (Boulder) Dam and Power Plant, the Parker Dam and Power Plant, the Shasta Dam and Power Plant, the All-American Canal System, and the Grand Coulee Dam, as well as dozens of others—projects that Oscar Chapman, former secretary of the interior, called "everlasting monuments to his engineering skills."†

For the Hoover Dam, which cost $130,000,000 and took two years to build, Savage introduced artificially cooled mass concrete, thus removing the setting heat in a few months instead of the 100 years otherwise required. So that such structures as Gibson, Parker, and Hoover could be designed safely and economically, Savage introduced the concept of the trial load method of arch analysis, which overcame inconsistencies between theoretical stresses and actual measured stresses in the

*_Current Biography_, p. 666; _John Fritz Medal_, p. 3.
†Phillips, p. 37.

finished structure. And for the Grand Coulee Dam, Savage and his assistants solved the problem of "twist" by leaving six-foot gaps, called "twist adjustment slots," in the concrete wall to provide "give" as the water pushed against the dam, to prevent cracking.*

Yet Savage disliked exclusive praise for himself, dreading the limelight and disliking the use of the first person. When asked for a list of his most important discoveries, Savage replied:

> Although I cannot lay claim to any specific important discoveries, it might be pertinent to mention my connection with the U.S. Bureau of Reclamation in charge of design during the period while the Hoover (Boulder) Dam, Grand Coulee Dam, Shasta Dam and many other important hydro projects were designed and constructed. During this period many important design and construction developments were initiated and perfected including new and comprehensive methods of foundation treatment, as for example the shaping of abutment excavations for Hoover Dam, the treatment of extensive shear zones at Grand Coulee Dam by unprecedented grouting, and the extensive and unprecedented treatment of fault zones by concrete-filled trenches and deep cutoff shafts at Shasta Dam. Likewise, it was during this development period of the Bureau of Reclamation that the trial-load analysis of concrete dams was advanced and perfected by the highly trained personnel of the designing department. Such important developments are accomplished by the joint efforts of a large number of engineers and not alone by any individual.†

He always insisted that he was "just one of Uncle Sam's employees."‡

Under his supervision, however, more important work occurred than that which he chose to single out: he and his associates invented a needle valve and other hydraulic equipment and devised a method for computing stresses in pipe shells and stiffener rings for supported penstocks, including the development of numerical and graphical methods for calculating the transient pressures in penstocks having several branches. They

*Phillips, p. 38.
†Savage, p. 2.
‡*Current Biography*, p. 665.

monitored the structural behavior of concrete and rolled-earth dams by making measurements on or within these structures, conducted plain concrete investigations, including deterioration of mass concrete caused by alkali-aggregate reaction, tested hydraulic models to obtain design data for spillary and outlet valves, and investigated land subsidence and increased seismicity caused by the weight of large reservoirs.

These represent only a part of Savage's achievements. He also organized the Technical Engineering Analysis and Laboratory Division of the Bureau, with consultants such as Professors H. M. Westergaard, H. J. Gilkey, and Fredrik Vogt. Respected as both an engineer and a man by his employees, he urged Bureau engineers to take graduate-level courses and to attend lectures given in Denver by well-known engineers who from time to time visited the Bureau. Called the first "Billion Dollar" American engineer (for the cost of the structures built under his supervision, not his fees), Savage invariably provoked admiring comments from his co-workers. "He was able to forsee unusual problems which could arise during the design and construction of Bureau structures," as one friend stated; "he required solutions to these problems before completion of the designs; and he recognized the importance of engineering research and development for providing data needed to design adequate structures." Another complimented Savage's instinct:

> He has a natural bent for dams the way some people are natural athletes. I was on consultation jobs with him and saw him look over a river and its canyons, examine the pertinent data, then without hedging or "if-ing" recommend a precise site for the dam and specify the best type of dam for the job it was supposed to do. This was the first time the people spending the money had dealt with Jack. So they decided to check him. They made all kinds of dam models, tests and cost estimates, then came right back to his advice. He's the only engineer I've met who works on hunches. Several times I've heard him give decisions based on "my hunch." We believe his hunches. We've never known one to go sour.*

*Phillips, p. 39.

In his later years Savage became a widely consulted authority on dams, consulted by at least nineteen countries on hundreds of projects. In 1938, for example, the British government asked for Savage's advice on the rapidly deteriorating Burrinjuck Dam in Australia. Savage was ready to go until an official remembered a law prohibiting federal employees from accepting fees from a foreign power. Undeterred, Savage decided to forego payment, wiring his superiors that "Any assistance will be gratis and I shall not accept any reimbursement for expenses. An overdue vacation will be sufficient gratuity."* He also served Mexico gratuitously, then in 1941 Congress unanimously passed legislation authorizing the President to send Savage on such foreign assignments as these to India and Australia.

Great Britain again called for Savage's aid in October 1941 in "furthering long-range hydroelectric projects to provide power for industrial centers heavily taxed by war production, and to provide for post-War industrial agricultural expansion."† Savage was issued a plane ticket for 31,000 miles—the longest then issued in Denver. Savage found the trip exhilarating, traveling first to Hawaii, where he was consulted on the design of underground fuel storage tanks, then to Australia, where he advised on the construction of a huge dam on the Upper Yarra in Melbourne and inspected the hydroelectric scheme in the Kiewa Valley. In the process he left a personal mark: "Australians," remarked one reporter, "apparently were impressed by the 'unassuming, soft-spoken' American engineer who held a Doctor's Degree [honorary] in his profession but who said, 'I don't use the Doctor. In the States they call me "Jack." ' He, in turn, spoke in warm praises of the 'Aussies.' 'They are a lovable people,' he said, 'full of fight and imbued with the will of preserving their last outpost of democracy in the Far East.' "‡

*Ibid.
†*Current Biography*, p. 666.
‡*Current Biography*, p. 667.

In Afghanistan, Savage worked on a series of dams that would nurture 1000 square miles of desert; in China, at Chiang Kai-shek's invitation and scuttling between battling Nationalist and Communist forces, he designed his "dream dam," the uncompleted Yangtze Gorge Project, which would have been capable of irrigating 10 million acres and controlling the wild Yangtze River. Such assignments typified Savage's career, even after his retirement in 1953. In one four-month period he traveled to Afghanistan, South Africa, India, Singapore, Formosa, Japan, and Australia. He returned home, then flew immediately to Canada; returning home again, he sped to Mexico. He once mentioned "sort of retiring some day and going back to the Wisconsin farm where I grew up, then taking a look at all the big dams in the West,"* but he loved his work too much, which he tackled in fourteen-hour days and weekends. An early associate remembered that although Savage was "the worst cook and poorest pistol shot in the world," he was also "first out in the morning and the last to leave work at night."†

Savage continually rejected potentially lucrative offers from private industry. "I guess I'm not a very good businessman," he once said. "The Bureau gave me all my opportunities and I was proud of its projects. I worked with a fine group of men. I don't think I could have been any happier elsewhere."‡ One associate commented that "Jack has never bothered to become independently wealthy, but he sure is independently happy."§ Savage expressed his philosophy by saying that he preferred to take part in "enterprises that have as their objective the development of human relations."‖

Such a philosophy was evident in his personal life. Married twice, first to Jessie Burdick Sexsmith on June 1, 1918 (deceased

*Phillips, p. 36.
†*John Fritz Medal*, p. 2.
‡Phillips, p. 39.
§Phillips, p. 40.
‖*Current Biography*, p. 666.

July 17, 1940), then to Olga Lacher Miner on January 14, 1950, Savage was childless but helped eleven nieces and nephews through college, as well as an orphaned girl he brought to his home from Nationalist China after World War II. He called children his "hobby," in lieu of more traditional but less interesting ones.

Savage was, in the words of one admirer in 1943, "a quiet, precise man, almost diffident in manner. He wears neat blue or gray suits, quiet ties. His hair is thinning and turning towards white. But his face is ruddy and brown, with the outdoor look. His eyes, magnified slightly by the rimless glasses he wears, have bottomless black pupils surrounded by an unusually wide, unusually bright gray iris. The effect is of one who looks afar."*

John Lucian Savage died December 28, 1967, in Englewood, Colorado, no longer keeping in shape—"and good shape at that"†—by climbing over dam sites in remote sections of the world, but leaving a legacy of numerous technical innovations and hundreds of completed hydroelectric projects. He was elected to the National Academy of Sciences in 1949. Earlier, the associations awarding him the coveted John Fritz Gold Medal Award in 1945 commented that "Among Savage's major satisfactions is that of having seen the West grow and thrive as a result of the Bureau of Reclamation program for power and irrigation. Nearly 5,000,000 people—one out of every five living in the seventeen Western states—are dependent in one way or another on the facilities designed under his supervision."‡ A fitting memorial for "Jack Dam" Savage.

**Current Biography*, p. 667.
†*Ibid.*
‡*John Fritz Medal*, p. 8.

HONORS AND DISTINCTIONS

HONORARY DEGREES

D.Sc., 1934, University of Wisconsin
D.Sc., 1946, University of Denver
D.Eng., 1947, University of Colorado

AWARDS

Colorado Engineering Council's Gold Medal Award, 1937, for "distinguished service in engineering"

Gold Medal Award of the National Resources Commission of China as a "Friend of China," 1944

John Fritz Medal, 1945, for "superlative public service in conceiving and administering the engineering of mammoth dams, both in America and beyond the seven seas," conferred by four American national engineering societies: American Society of Civil Engineers, American Society of Mechanical Engineers, American Institute of Electrical Engineers, and American Institute of Mining and Metallurgical Engineers

Henry C. Turner Gold Medal Award, 1946, from American Concrete Institute "in recognition of long and distinguished service in the design of hydraulic structures including some of the world's most notable dams"

Washington Award, 1949, for "unselfish public service devoted to the creation of monumental hydraulic structures utilizing natural resources," conferred by the Western Society of Engineers on recommendation of a committee representing the American Society of Civil Engineers, American Institute of Mining and Metallurgical Engineers, American Society of Mechanical Engineers, American Institute of Electrical Engineers, and Western Society of Engineers

U.S. Department of Interior Gold Medal Award, 1950, for "distinguished service"

Reclamation Hall of Fame, May 1950

Popular Mechanics Hall of Fame, 1952

"Order of Ching Hsin," 1952, from Nationalist Government of China

ORGANIZATIONS AND OTHER HONORS

Member of honorary fraternities: Tau Beta Pi, Sigma Xi, and National Honorary Member, Chi Epsilon, 1945

Member, American Society for Testing Materials
Member, Colorado Society of Engineers
Member, American Concrete Institute
Member, Institution of Civil Engineers of Great Britain
Honorary Life Member, Reclamation Technical Club
American Society of Civil Engineers: Associate Member since 1907, Member since 1916, Honorary Member since 1941, and Life Member since 1942
American Vice-President of International Commission on Large Dams of World Power Conference, 1937–1939 and 1946–1947; Member, Executive Committee, U.S. Committee on Large Dams, 1946–1949; and Advisory Member, 1949–1953
Fellow, American Association for the Advancement of Science, 1947
Member, National Academy of Sciences, 1949
Member, International Development Advisory Board, Office of the President, U.S. Department of State, 1950

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KEY TO ABBREVIATIONS

Civ. Eng. = Civil Engineering
Eng. Found. = The Engineering Foundation
Eng. News Rec. = Engineering News-Record
Hydraul. Eng. = Hydraulic Engineering
Reclam. Era = Reclamation Era
Reclam. Rec. = Reclamation Record
Trans. Am. Soc. Civ. Eng. = Transactions of the American Society of Civil Engineers
West. Constr. News = Western Construction News

1917

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1931

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1932

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1933

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1934

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1936

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1937

The Boulder Dam. Institution of Civil Engineers Journal, 6(7):161–80. Also in: Concrete and Construction Engineering, 32:355–61.

1939

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1942

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