

SEM HISTORY

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Dr. Marshall Holt, Eleventh SESA President

Marshall Holt was the SESA President in 1953-54. Those of us who knew him still remember Marshall as an extremely conscientious and talented engineer, a serious but cordial colleague, and a man with great personal integrity. Because he was so modest and seemed to shun the spotlight, he may not have received as much recognition within SESA/SEM as he truly deserved. Now, some forty-seven years after his presidency and twenty years after his death, it is not easy to locate any of Marshall's former colleagues who can provide information about his professional career and his personal life. However, we are indeed fortunate to have found an uniquely qualified author, namely: his son Tim.

John M. "Tim" Holt, followed in his father's engineering footsteps and earned a Masters Degree (TAM) from the University of Illinois. Tim was an SESA member for several years and was active in the Pittsburgh Section of the Society. We appreciate Tim's writing of the following article for the SEM History Series.

— C. E. Taylor, SEM Historian

MARSHALL HOLT

(1906 - 1981)

by John M. "Tim" Holt

When Chuck Taylor asked me to prepare this biographic sketch I thought that it would be a fairly easy job. As Chuck said, "who knows your father better than you?" I knew my father as "Dad," but not as Marshall Holt, Professional Engineer. During the 25 years that our careers overlapped, on paper we had similar professional interests, albeit he in the aluminum industry and I in steel. However, we served together on only one brief technical activity. Con-sequently, much of what follows are vignettes supplied by those who worked with him at the Aluminum Company of America (Alcoa) and on various technical activities. To these contributors I am indebted.

BACKGROUND

Marshall Holt was born 1906, April 6 and raised in Greenup, Illinois, a small farm-oriented community. He was the youngest of five children. His father sold general merchandise in addition to being the community undertaker.

FORMAL EDUCATION

He attended the University of Illinois where he received his BS (1927) and MS (1929) in Civil Engineering. He continued his education at night school at Carnegie Institute of Technology (now Carnegie-Mellon University) from 1935 to 1940. In 1940, he realized that he had completed most of the course work required for a Ph.D.. Because of residency requirements, he transferred to the Mathematics Department of the University of Pittsburgh where he could earn a Ph.D. without the burden of full-time campus residency and still pursue his interests in engineering mechanics. In June 1947, he received his Ph.D. from the Mathematics Department; the title of his thesis was: "A Study of the Beam-Column Problem." In June 1950, he was granted the Professional Degree of Civil Engineer from University of Illinois.

He became registered by the State of Pennsylvania as a Professional Engineer (Civil Engineering) in 1937.

EMPLOYMENT

During the summers of his college years, Marshall worked for the Illinois Highway Department in a surveying crew and for a steel fabricator in their design department. While pursuing his Masters Degree, Marshall was a half-time research assistant in the CE Department's Structural Laboratory working under the direction of Prof. W. M. Wilson.

In today's world, he was unique in that his entire career was with a single employer, The Aluminum Company of America (Alcoa), at their Research Laboratories (ARL) in New Kensington, Pennsylvania beginning 1929, June 3. (As a point of reference, his starting salary in 1929 as a "Research Engineer" was in the order of \$140 per month.) Because aluminum was a new structural material, there was no established market for it. Thus, in order to grow as a company, Alcoa had to support research that would establish markets and develop the engineering data to insure that the material was properly used in those markets. For this reason, many of Marshall's colleagues have stated that the 1930's, 1940's and early 1950's were the "golden age" of aluminum-oriented research. A classmate of Marshall's, R. L. Moore, who started at ARL at the same time wrote: "Since Alcoa was the only producer of commercial aluminum in this country, any progress that could be made in improving the product and expanding markets was good for Alcoa. Under such conditions attitudes were more relaxed and there were few of the pressures that characterized work in my later years. Research could be pursued in the hope of long-range benefits and, within rather broad limits, we had considerable freedom in determining what and how research in our specialty should be conducted."

At that time, ARL consisted of two divisions, Physical Testing Division, headed by R. L. Templin and a chemistry division. In addition to the work that is normally associated with physical testing, their charter included structural engineering and analysis. Thus, Marshall was a member of the Physical Testing Division. In 1943, a separate Engineering Design Division was created and Marshall was transferred to it. Shortly before this, he was one of two promoted to the newly created position of "Senior Research Engineer." In 1951 he was promoted to Assistant Division Chief, Engineering Design. In the mid 1950's, he was transferred to the Mechanical Testing Division as Assistant Division Chief and promoted to Division Chief in 1959 following the retirement of F. M. Howell. In accordance with company policy, Marshall retired on April 30, 1971 at the age of 65 having worked for Alcoa for 42 years.

TECHNICAL INTERESTS

From discussions with his colleagues both at Alcoa and in his various activities, it appears as if Marshall's primary interest was in obtaining test data, analyzing that data and then presenting it so that it could be used to expand the use of aluminum in the design of civil engineering structures including pressure vessels and aircraft components. As a consequence of this interest, he authored or co-authored 76± papers that were published in the open literature and another 266± reports that were internal to Alcoa. Marshall published to impart knowledge about "his favorite metal," not to become known or not to perish.

In the 1960's, he listed his interests as "engineering structures and materials, stress analysis, beam-column problem, creep, fatigue strengths of materials and rivet and welded joints, mechanical properties of aluminum and materials engineering." His interest in creep extended out to obtaining data for lives of 105 hours. The latter part of his career was largely spent in developing the data, the formulation of design rules and then seeing that code writing bodies adopted this information into the design codes; he was especially interested in code activity pertaining to fired and unfired pressure vessels fabricated from aluminum. As I prepared this article, several members of these various code writing bodies commented that one of the things that they remember about Marshall was "his forceful presentation of data at the meetings" and the quality of that data. Gil Kaufman stated that "he feels that one of Marshall's more significant contributions was the 'translation' of mechanical-test data, especially creep data, into design data." Much of the design allowables for aluminum in the pressure-vessel code were the result of his analytical work and by dint of "his powerful personality" or as Marc Bressler phrased it "by sheer strength of will."

As previously noted, at the time that he began work at ARL, their chief reason for existing was to develop new applications for aluminum. This required test information in a format that could be given to engineers of potential customers so that they could design their products using aluminum rather than another material; usually the material to be replaced was steel. Often in addition to presenting data to the potential customer,

a proposed design for an existing part or even a redesign of the entire structure was also submitted. Thus, Marshall worked with the Alcoa Sales Development Group to obtain and analyze the test information and to help present the data to the potential customer or code writing body.

Many of early internal reports dealt with developing design data from tests on structural sections built using aluminum. The results from these tests were compared with theory and with results obtained from similar sections using steel. In 1933, the City of Pittsburgh accepted Alcoa's offer to extend the life of the Smithfield Street Bridge (built 1881-83) by replacing a number of deteriorated steel members with aluminum members. Marshall was on the initial 1933 team and on a 1939 inspection team to determine how well it was holding up. The irony of this work was that in the early 1920's numerous outstanding bridges were being built and so he had decided on a career in Civil Engineering, "because he wanted to build bridges" — this was the only bridge on which he worked.

By 1943, he was familiar enough with the "new" SR-4 strain gages to recommend their use in a rolling mill to guide the operators when rolling aluminum foil. At this time, mill equipment such as rolling mills, forge presses, etc. were rated on the basis of forces required to fabricate steel, thus, it was necessary for Alcoa engineers to "rate" the equipment to fabricate aluminum. Because of problems associated with openings in pressure vessels, especially reinforced openings, he familiarized himself with photoelastic techniques to determine the magnitude of the strains at these locations. Undoubtedly, it was these interests that caused him to become an early member of the Society for Experimental Stress Analysis; Chuck Taylor has suggested that he was probably a charter member.

Marshall was considered a mentor by many of his colleagues especially those at ARL. He helped them "grow" by subtle suggestions and questions. When new members joined the Division, he would involve them in one of his current projects and coach them until they were able to take it on as their project. Of course, he had a selfish motive in that he could proceed to another project. As an example, the research for his Ph.D. thesis, "A [Mathematical] Study of the Beam-Column Problem," raised other "questions" that he wanted to study. Fortunately for him, J. W. Clark had recently joined the Engineering Design Division and desired to obtain a Ph.D. In collaboration with Marshall, Dr. Clark submitted a proposal to the University of Pittsburgh to work on one of these questions with Marshall being Dr. Clark's thesis advisor.

PROFESSIONAL ACTIVITIES

He strongly believed that one should be involved in the technical community at the local level as well as at the national level, both to support the community with his ideas and to learn from the ideas of others with similar interests. As stated earlier, Marshall's only reason for publishing was to share knowledge. Rarely did he seek an office, preferring to be a "worker." I believe that the only national offices that he held within his technical activities were those associated with SESA. He was a member of the Executive

Committee (1950-57), Vice President (1953) and President (1954). Other professional memberships include: Life Fellow of the American Society of Mechanical Engineers (ASME) and member of Pressure Vessel Research Committee (PVRC) Boiler Code, Section 8, member Subcommittee on Properties of Metals and its Task Group on Strength — Nonferrous Alloys; Fellow of the American Society of Civil Engineers (ASCE); member of the Materials Property Council (MPC), honorary emeritus member of the Technical Advisory Committee; member of the American Welding Society (AWS); and member of RESA (Scientific Research Society of America). In all of these, he continued to contribute his expertise after he retired from Alcoa.

THE MAN

Although he had many technical accomplishments, he was first and foremost a family man in every sense of the concept. He and his wife, Anna, celebrated 50 happy years of marriage in the year preceding his death. They had one son, me, for whom he always had time. Marshall was active in Boy Scouts, including Scout Master of the YMCA troop, from the time that he first came to New Kensington until his son was born; while scout master, he earned the rank of eagle scout. When I joined Cub Scouts, he became the Pack Master of the Cub Pack and when I joined the Boy Scouts became active in the Troop Committee and furnished a car and driver to transport the troop to events. He enjoyed sharing life with his grandchildren; when they visited, he subtly mentored them with games, walks, reading, etc.

While in high school and at the University of Illinois, he played the tuba in the marching band. He commented that one nice thing about being a tuba player was that the band manager, and not he, arranged for the transportation of the instrument to and from events because it was so big while the other band members were responsible for their smaller instruments.

He was either the teacher or the substitute teacher of a men's Sunday-School class for many years. He was an active volunteer for local charities; he especially enjoyed being a "bell ringer" at a Salvation Army kettle at Christmas time. He assumed the responsibility for the day-to-day upkeep of neighborhood parklet until the time of his death. He felt that if he was to criticize the local politicians, he had to offer them something in return; therefore, he became an unpaid, engineering consultant to the mayor and city council even though they were of "the other political party;" he felt no one could accuse him of "having a vested interest" if he was unpaid.

Marshall had a reputation for being fussy about writing; the document was to be clear and correct — technically and grammatically. This conviction is expressed in "Knowing is Not Enough," ("Experimentally Speaking," published in *Experimental Mechanics*, June 1961, p 3A, is reprinted at the end of this article). His subordinates referred to his review of their written work as "Marshallizing" and the finished product written in "Marshall's English." One time (ca 1955), several of those reporting to him produced an "underground" 8-mm film that was a series of vignettes "of a day at Alcoa's Research Lab." Most of the scenes were shot without management's knowledge or approval,

however, the one scene with management's (in this case, his) approval had an engineer bring a report to "Marshall Matt Dillon-Holt" (borrowing from the TV show "Gunsmoke") for review and approval. The engineer presented the report and after reading it, Marshall pulled out a six-shooter, blew across the end of the barrel and chased the "villain" who wrote it. (As his son, I can appreciate these comments in that he often commented on my writing while growing up and on some of my technical writing after it had been similarly reviewed by my employer.) Several who related this to me as I prepared this article, stated that "He enjoyed opportunities to spoof his colleagues."

Marshall was not one to needlessly spend money — whether from his pocket or from the company's. Paul Dickerson, welding engineer, tells of one time when he and dad were traveling together. As they were checking into the hotel, the manager approached them saying: "It appears as if you two are together; because I have oversold the hotel, can I interest you in sharing a room?" Paul immediately said "No," but Marshall elbowed Paul and said "Let's see what he has to offer." The manager took them to the Presidential Suite which occupied half of the top floor. Marshall asked "How much?" "I'll let you have it for the cost of a single." "We'll take it." The manager also gave them each two chits for free drinks during Happy Hour. Because it was early afternoon, Marshall and Paul prepared for the next-day meeting in one of the suite's rooms; at five, Paul said "Let's enjoy the drinks." Marshall said "Let's finish and have dinner later" — Paul discovered that Marshall was a teetotaler. He tried coffee at breakfast for several months, but quit explaining that "he finally understood why people said, 'I can't face the day until I've had my morning coffee;' coffee tasted so bad, that the rest of the day had to be better."

A. Karl Schmieder described him as "a 'gentleman of the old school,' quiet spoken, courteous, with moral standards more strict than the 'letter of the law.' He was serious about fulfilling his obligations to his employer and contributing to engineering technology." Carl Spaeder recalls him as "the personification of integrity. He insisted that all the technical output of the MPC was based on reliable research and that the conclusions were supported by the data. He tended not to speak often but when he did the comment was useful and to the point. ... In many ways, he was the 'John Adams' of the technical community."

He enjoyed keeping busy. He arrived at work early and stayed late; in 1939, he built his home in a location where he could walk to work (shine or rain) and come home for lunch with his family (the lunch period was 45 minutes by a time clock!). After he retired he continued to return to ARL to use their library facilities or to be briefed about new information to take to a committee meeting. When asked about retirement, he commented, "six Saturdays a week are too many." The colleague who related this continued, "His colleagues recognized how much his work meant to him and that he had truly enjoyed his work and solving problems." Because he was not one to just sit around and "kill time," he took on his volunteer activities, took care of his wife, puttered around his home and truly enjoyed his grandchildren. At the time of his death, 1981, April 23, he was working on an advanced draft of "Welding Structural Aluminum" for the AWS.

In closing, I wish to thank Chuck Taylor for asking me to prepare this biography of my father and for the information supplied by many of his colleagues, only a few of whom are named. By this activity, I got to know my father even better and also to see him through eyes that were not as prejudiced as mine. If anyone wishes to offer additional stories to pass on to his grandchildren or corrections, I would appreciate receiving it. I hope that I have used "Marshall's English."

Following is a reprint of Marshall Holt's article "Experimentally Speaking," published in *Experimental Mechanics* in June 1961, when SEM was known as SESA. The article is just as relevant today as it was 40 years ago.

— John M. "Tim" Holt

"KNOWING IS NOT ENOUGH

There is a big difference between knowledge and understanding. A brain crammed with knowledge is of relatively small value if the bits of knowledge cannot be called forth and properly transmitted to others. Engineers, particularly young ones, sometimes become frustrated because good ideas are not picked up by their supervisors and put to work. It is likely that failure to pick up the idea results from distortion or lack of clarity in transmission from one to the other. There are at least two reasons for situations of this kind. Mankind has more ideas than words to express them, so that some words are associated with several ideas. In fact, my dictionary gives ten uses for "word." On the other hand, there are many groups of words which have almost the same meaning; for example, one might use any of the following verbs to indicate that some new thing or idea has been brought to light: reveal, show, manifest, exhibit, display, disclose, evidence, prove and divulge. The manner in which a new thing is developed can be intimated by the choice of the verb. It is thus apparent that the choice of the proper word is very necessary for the clear and facile transmission of a thought from one mind to another. A poor selection of words can be covered up by the use of additional words, but these additional words extend the time required for the transmission of the idea and they require further effort on the part of the receiver to grasp the idea. In addition to having knowledge of a subject, the teller must have such an understanding that the correct words can be chosen to create in the minds of others the image of the idea in his mind. Many speakers and writers are careless or ignorant of the rules of good grammar. No serious reader should be required to expend effort to ferret out even a good idea from a mass of jumbled, mutilated sentences. Correct punctuation will often clarify the meaning of a word, and indicate whether it is used as an adjective or as a noun. Effective speaking and writing are not accidents; they result from careful attention to details. Pleasant inflection of the voice can be used to emphasize key points and will help in keeping a listener's interest awake. Clear sketches and pictures may save many words. Knowing is not enough; to be successful, one must make it easy for others to know, too."

— **Marshall Holt**

PAST PRESIDENT, SESA