

Sabine Acoustician Number Three

In 1957 Hale Johnson Sabine came back to Riverbank. His arrival marked a special kind of homecoming; although he had periodically dedicated his time, effort, and services over the past thirty-eight years to further the development of the Riverbank Acoustical Laboratories, he was never officially on the payroll. Now, however, he was. As a senior physicist for the Armour Research Foundation (ARF — now the IIT Research Institute [IITRI]), one of his duties was to correlate and conduct research projects involving acoustics, either at IITRI, in the field, or at Riverbank. Shortly after joining IITRI, Hale Sabine arrived at the Geneva laboratory to perform some preliminary work on a siren project. Along with the greetings and well wishes of the staff, he was handed a written message: “Congratulations, you finally made it.” Although written by the secretary, the note was in regard to an earlier telephone call and the message given by Hale’s father, Paul E. Sabine.

As Hale Sabine wandered from room to room, acknowledging how much had changed and yet how much was still the same, one could only imagine his thoughts, his memories of the place where he had not only worked but grown up. Did he remember back to February 1919 when he was only ten years old and, with his parents, first saw his father’s new laboratory? Did he recall how he assisted his father and other scientists during the early tests because of his excellent hearing and tone perception? Did he see himself again hanging from the Riverbank bell rope or involved in turning the laboratory into a haunted castle as he did on one Halloween?

After graduating from Geneva High School, Hale Sabine attended Knox College in Galesburg, Illinois and following in the footsteps of his father and Wallace Clement Sabine, he entered Harvard and majored in physics. After Harvard, he returned to Chicago and, in 1930 took a position with the Celotex Corporation, which got him involved with Celotex Director Wallace Waterfall, the Acoustical Materials Association (AMA), and various Celotex

tests being conducted at Riverbank. One of Hale's tasks at Celotex was to format data for inclusion in the AMA bulletin.

During the late 1930s and early 1940s, in addition to his duties at Celotex, Hale Sabine assisted his father and Augustus Grote Pohlman on an extensive program involving the evaluation of hearing aids. During this same period he wrote three papers that appeared in *JASA*. The first, coauthored with R. Lindahl, was entitled, "Measurement of Impact Sound Transmission through Floors;" for Celotex and *JASA*, he wrote "The Absorption of Noise in Ventilating Ducts." Both of these articles were published in 1940. In 1942 he wrote "Notes on Acoustical Impedance Measurement."

During World War II Hale Sabine found himself doing a variety of tests at Riverbank while Paul Sabine continued his research at Harvard University on antisubmarine warfare. Luke Ramer was in the service as well, and the only Riverbank staff members left were Elizabeth Tinburg, the secretary, and Robert Kerfoot, a part-time technician. Because Kerfoot wasn't always available, it was Hale Sabine's responsibility to come in whenever time permitted and conduct scheduled tests. Only because of his voluntary efforts, usually requiring work on the weekends or in the evening, were certain Riverbank clients able to fulfill their testing needs to obtain a contract.

Hale Sabine's conscientiousness became even more evident in a letter he wrote to a manufacturer during this time. After running a test and rechecking the calculations a week later, he realized he had made a small error. He immediately contacted the manufacturer and offered to pay for reshipment and do a retest. Eventually, he reran the test and, later, explained it all in a letter sent to his father at Cambridge. "I fully realize that I will undoubtedly make many more errors in the future, which is somewhat disturbing" he wrote, "however, let me assure you, never again that one."

In 1944, pleased with son's voluntary work at Riverbank, Paul Sabine signed the deed of his Glen Ellyn home over to Hale and his wife, Marjorie Ballard Sabine. At the time, the Hale Sabines were living in the home and still had eleven years to go on a purchase contract with the elder Sabine. Until this incident, however, Paul Sabine had always demanded that his son pay his fair and full share. The Riverbank files contain a number of notes in which Paul Sabine would request reimbursement from Hale for instrumentation or parts purchases; meeting or consulting trip expenditures such as hotel bills, meals, gasoline, and parking; or other incidental expenses. The notes would usually be brief: "Dear Hale, Your full share comes to exactly" and then the amount to the penny would be given. The notes would be signed "respectfully" or "affectionately yours, PES."

At the end of the war, Paul Sabine and Luke Ramer returned to Riverbank, and Hale Sabine turned all his attention to his duties at the Celotex Corporation. In 1947, when Paul Sabine retired, Luke Ramer took over as Riverbank manager. Although the elder Sabine might have enjoyed handing control

over to the younger, Ramer had earned the position because of his many years of service to Riverbank.

Like both Wallace Clement and Paul Earls, Hale Johnson Sabine was a committed researcher and writer. He wrote a book, *Less Noise, More Hearing*, in 1941, and his articles appeared in national journals and were indicative of the range of his knowledge as well as the depth.

In 1943, he coauthored a paper with R. Allen Wilson, also of Celotex, entitled "The Application of Sound Absorption to Factory Noise Problems," which, like his previous articles, appeared in *JASA*. In 1947, "Sound Absorption and Impedance of Acoustical Materials" was first presented at the Society of Motion Picture Engineers (SMPE) convention in Chicago, and later it was printed in the September issue of the *SMPE Journal*.

During the 1950s, Hale Sabine continued to write papers based on his work for Celotex, starting with "A Review of the Absorption Coefficient Problem," published in the May 1950 *JASA*. For a 1951 symposium on acoustical materials and the American Society for Testing Materials (ASTM) Special Technical Publication No. 123, he authored "The Measurement of Sound Absorption." On October 10, 1952, he wrote and presented a paper at the Third National Noise Abatement Symposium, "The Use of Acoustical Materials in the Control of Industrial Noise." This symposium was held at the ARF.

In the same year, Hale Sabine wrote "The Exploratory Study of Sound Absorption by Thin Structures" followed by "The Relation of Fiber Characteristics to Acoustical Properties." In 1953, he presented a paper, "Room Acoustics," for a seminar — "Acoustics for the Radio Engineers" — organized by the Institute of Radio Engineers Professional Group on Audio for the IRE National Convention; it was later published by the organization.

In 1954, Sabine's papers included "Manufacture and Distribution of Acoustical Materials over the Past 25 Years" and "Industrial Noise Survey." The latter led to another paper completed on May 17, 1954 that was entitled "Progress Report IV"; however, it contained an in-depth extension of the work originally done by Uno Ingard of the Massachusetts Institute of Technology, entitled "Sound Absorption by Perforated Porous Tiles." Hale Sabine added much to the paper and it was later retitled "The Sound Absorption of Acousti-Celotex Core Tile." Hale Sabine's calculations and explanations were so thorough that the paper is still used for reference purposes at Riverbank.

Appearing in the *Bulletin of the School of Education* at Indiana University was a paper given by Hale Sabine at the Midwest School Building Planning Conference in 1955, "Sound Control in School Building Planning." Sabine also marked his twenty-fifth year at Celotex in 1955. On October 25 of that year, Wallace Waterfall wrote to congratulate him:

I am told that on Thursday of this week you will be celebrating your 25th anniversary with Celotex. It doesn't seem like 25 years ago that I hired you but it is just another indication that time passes swiftly.

During the past 25 years you have attained national stature in the field of acoustics and you have done much to give Celotex the technical prestige which it enjoys in the field. I know that Celotex is as proud as I am of your accomplishments and we wish you the best of luck for continued success.³⁶

In January 1956, ASTM Bulletin No. 211 included a paper entitled, "An Apparatus for Measuring Air-Flow Resistance of Acoustical Materials," by Hale J. Sabine, secretary of Committee C-20 on Acoustical Materials. During this same period, Sabine worked on a Celotex project conducted by the ARF. The report was entitled "The Relation of Fiber Characteristics to Acoustical Properties." Soon after, ARF conducted another project headed by ARF's William E. Lawrie. The final report was dated June 1956. The report, "The Development of New Sound Absorbing Materials for Noise Suppressors," listed Hale Sabine of Celotex as a contributor to the project.

In 1957, ARF Director Hal Leedy made his move to obtain the services of Hale Sabine. Leedy had been a member of the National Noise Abatement Council that had been headed by Paul Sabine during the early 1940s and was instrumental in the takeover of Riverbank's activities when Sabine retired. Leedy was also a member of the American Standards Association's Z24 Committee, Sub Committee E, which included among its members Hale Sabine. Needless to say, Leedy was familiar with Sabine's talents and work and offered him a position in ARF's Physics Department; Hale Sabine accepted.

The September 1957 *ARF News*, under the headline "Appoint Four to High Foundation Positions," devoted a page to new employees of the organization. The four individuals were Howard Betz, Hale J. Sabine, Narinder S. Kapany, and Mildred Wyatt. In regard to Hale Sabine, the article stated the following:

Hale Sabine, a specialist in acoustical materials, joined the Physics staff as senior scientist in the acoustics design section. Sabine came to the Foundation from the Celotex Corp. where he served as chief acoustical engineer. He had conducted research in acoustical building materials for 26 years. He attended Knox College and received his degree in physics from Harvard University in 1930. He also wrote a textbook on architectural acoustics engineering, entitled "Less Noise — Better Hearing."

The Thursday, August 1, 1957 edition of the Chicago *Daily Tribune* had this to say:

Hale Sabine, of Glen Ellyn, a specialist in acoustical materials, has been named senior physicist for the Armour Research Foundation of the Illinois Institute of Technology. The announcement was made by Dr. Leonard Reiffel, manager of the physics research department.

Sabine will conduct research in the acoustic design section of the department, working in areas of sound propagation, sonics, ultrasonics, loudspeaker design, and microphone development. Before joining the research foundation, Sabine was chief acoustical engineer for the Celotex corporation, where he conducted research in acoustical building materials for 26 years. His previous research in-

cludes field engineering for the correction of auditorium acoustics and noise reduction and the development of acoustical products.

Hale Sabine was assigned to the Acoustical Design Section, which was managed by Mahlon Burkhard.³⁷ Shortly after his assignment to this section, he came to Riverbank for the siren project. As an ARF-IITRI staff member, he conducted a variety of projects associated with acoustics at IIT and Riverbank and in the field. One project that Hale Sabine worked on at both IITRI and Riverbank was for the Building Research Institute, Division of Engineering and Industrial Research, National Academy of Sciences–National Research Council, which was written up and printed in publication no. 798 under the title “Acoustical Design Criteria for Sandwich Panels.” On November 6, 1959, Hale Sabine completed a project entitled “Sound Transmission on Characteristics of Folding Partitions.”

One of Sabine’s tasks at Riverbank for ARF was to conduct a project and write an article for the March–April 1960 issue of the ASA publication *Noise Control*, “The Effect of Painting on Sound Transmission Loss of Lightweight Concrete Block Partitions.” On September 14, 1960 Hale Sabine completed his report entitled “Fundamental Study of Noise Reduction of Pneumatic Tools,” followed in May 1961 by “Measurement of Sound Transmission through Door Seals.” In October of the same year he completed “Design of Electromagnetically Shielded Anechoic Rooms” and turned in a lengthy progress report on the extension of the same project on December 10. Also in December was his report entitled “Sound Propagation Near the Earth’s Surface as Influenced by Weather Conditions.” This research also involved an extension that resulted in another report completed in January 1961.

In 1961, Sabine left IITRI–Riverbank to become manager of the Owens Corning Acoustical Laboratory. He presented a paper at the sixty-first meeting of the ASA in Philadelphia on May 10, 1961, which involved his work on the IITRI–RAL project, Measurement of Sound Transmission through Door Seals.

In 1968, the Acoustical Society of America awarded Hale Sabine the Wallace Clement Sabine Award. Following is an account of the award presentation, written by William A. Jack and then ASA President Robert T. Beyer:³⁸

The Wallace Clement Sabine Award was presented at the 76th meeting of the Society in Cleveland, Ohio, to Hale J. Sabine. The award was made at the banquet of the Society on 20th November 1968.

The Wallace Clement Sabine award is presented at 1- to 3-year intervals to an individual of any nationality who has furthered the knowledge of architectural acoustics, as evidenced by his contribution to professional journals and periodicals, or by other accomplishments in the field of architectural acoustics. The award is named for the virtual inventor of the field, the late Professor W. C. Sabine of Harvard University.

The citation to Hale J. Sabine read as follows:

For his contributions to the theory and practice of architectural acoustics, for his studies of the theory of sound absorbing materials, and particularly, for his vigorous leadership in the development of standard procedures for measuring the acoustical properties of materials.

The career of Hale J. Sabine was highlighted in a brochure distributed at the banquet:

This evening, The Acoustical Society honors a man who was born into the acoustical materials sphere. He has grown with it, studied its problems, contributed greatly to needed solutions, and has taken an honorable part in activities of an industry that strives to manufacture commodities that fit the market in a competitive world.

Hale J. Sabine is the elder son of the late Paul E. Sabine, a man remembered with affection and respect by those of us who were privileged to know him. During his father's tenure as head of the Riverbank Acoustical Laboratories at Geneva, Illinois, Hale grew up in an atmosphere of acoustical science and engineering.

On joining the Celotex Corporation in 1930, he moved into a field where the broad principles of application of sound absorbing materials to auditorium correction and to office noise reduction were understood, but sales were small. The Mazer discovery — that a pattern of relatively few holes drilled into a painted block of suitable material makes an excellent and repaintable sound absorber — resulted in a valuable patent acquired by Celotex. The Norris discovery — of well-distributed small openings in a rigid and otherwise impervious facing, over a blanket absorber — arrived to spur competition. Business in the industry grew, despite a recession. Hale grew with it, rising to be Chief Acoustical Engineer.

His four years with Armour Research Foundation, where he participated in, and directed, a variety of contract research projects in architectural acoustics, and in other acoustic fields, enlarged his experience and his circle of acquaintances and colleagues.

For the last 7 years, he has been manager of the Sound Laboratory, Owens-Corning Fiberglass Technical Center, directing acoustical research and technical support activities of this important company.

The acoustics of building materials is a subject covering a wide range of concepts, mathematical analyses, and test methods. Suitable commodities must be developed, manufactured, and merchandized; and they must serve the purchaser properly. Hale has contributed in important ways to measuring flow resistance and impedance, to evaluating and predicting the performance of lined ducts, and to developing testing techniques for transmission loss and reverberation chamber absorption.

He has served the Society well on its committees, and as its president in 1959–1960. He is a charter member of ASTM Committee C20, which has the responsibility for the standard test procedures used in architectural acoustics, since its foundation in 1948. In his capacity as Vice-Chairman of the Committee and as chairman of the subcommittee on sound absorption, he is a leading spirit in standards writing activities and associated projects. In industry circles, he has

been active on the Technical Committee of the Acoustical Materials Association.

The award of this medal is a deserved tribute to a man who combines in a most happy fashion the talents of scientist-experimenter-engineer in a field where the entire gamut, from the conception of a project to its successful in-place performance, is the measure of the service.

Like his father before him, Hale Sabine was not only a scientist but a humanist as well. Although Paul Sabine's interests led him into the realm of metaphysics, Hale Sabine's avocation was music, a discipline befitting a man whose career dealt with acoustics. As noted in an earlier chapter, Hale Sabine's mother was an accomplished organist, and she passed her talent to her son. With his innate sense of pitch, his diligence to perfect anything he set his mind to, it is not difficult to accept that he became an accomplished musician at a very young age. On January 1, 1929, in fact, he gave a recital in Geneva, Illinois, playing pieces by Mendelssohn, Tchaikowsky, and Bach.

In addition to performing music, Hale Sabine at one time had ambitions of becoming a music teacher. After graduating from Harvard, he began working on an education degree at the University of Chicago. In the Riverbank files are three term papers he wrote while a student in the Education Department there. The first, dated June 16, 1934, was entitled "The Psychology of Music Reading." The other two, both undated, were "The Evolution of Teaching Methods in the United States" and "Music and the Church."

Still employed at Celotex, he fulfilled the requisites to become a teacher and was registered with the Clark Brewer Teachers Agency. He applied for a teaching post at Worcester, where his father had taught, and was accepted as an instructor of math, physics, and music. From his letters to a professor, it appeared that he was lined up for a position for the fall semester. Apparently, something happened to change his mind about a teaching career, but because no other correspondence or mention about pursuing this career have been found, the reason might never be known.

Hale Sabine did, however, continue with work involving music. On October 20, 1960, he presented a paper, "Decay Characteristics of Piano Tones," to the ASA in San Francisco. The paper was an extension of work done by Daniel W. Martin of the Baldwin Piano Company, who had published "Decay Rates of Piano Tones" in the July 1947 *JASA*.³⁹

The only other tidbit available in this Hale Sabine music file was a small note that interestingly was paper clipped to the outside cover, with one word, "Yes" added and underlined. The note stated, "The Long Trail," Kipling Verse, Inclusive Edition, 1885-1918. "And it's time to turn on the old trail, our own trail, the out trail, Pull out, pull out, on the long trail — the trail that is always new!"

In 1976, Hale presented a paper that, in 1977, would be his last published

work. In “Building Acoustics in America, 1920–1940,” besides the science itself, Hale Sabine discussed the contributions made by Professor Wallace Sabine, Paul E. Sabine, Colonel George Fabyan, and Riverbank.

My first contact with Hale Sabine occurred a summer’s day in 1976 — a day that turned out to be a memorable day for both of us.

I had just transferred from fire and explosives research and was a veteran of Riverbank and architectural acoustics all of a whole day and a half. The rest of the staff had for reasons mostly forgotten — but never forgiven — left me alone to take care of things. As I recall one member, Don Zedonis, Riverbank employee 1949–1978, was on a field project, and the other two, Don Williams (1949–1986) and Arline Mundy (1953–1983) were on vacation.

That day the questions asked by six individuals succeeded in substantiating that I had little to absolutely no experience in architectural acoustical testing. Mostly confused and frustrated, I began paging through various handbooks hoping to establish one way or another that either acoustical testing was indeed strange or those six questions were a set up by the Riverbank staff members long recognized for such pranks.

Near the end of that very frustrating day an individual called, identifying himself as Hale Sabine. My immediate reply was, “Say, are you the person whose name is on our front door?” After a pause his reply was, “Sorry, same family, same profession, different person.” “Oh, that’s still great!” I replied. “That means if you are indeed involved in this profession, hopefully you may know something about this acoustical testing business. You see, Mr. Sabine, I have been asked some very strange questions today, and I sure could use some expert advice, whereby I may determine if the calls were only a prank arranged by my coworkers or if they were for real.”

Once again there was a pause and then in a soft voice and in a polite manner, Hale Sabine stated,

Somehow I have the sensation that I am being complimented; however, although I have spent a life time associated with acoustical testing in one form or the other, you have suddenly made me realize that I have now reached that critical stage in my life whereupon there obviously exists a generation gap within my own profession, and thereby if I fail to answer your questions, I could devalue my present professional status significantly.

Now, totally embarrassed, I apologized to Hale for my obvious extreme ignorance about architectural acoustics and those involved in it. After explaining my past history at IITRI and my very short career in acoustical testing, Hale Sabine eased my embarrassment immensely by stating that an apology was not in order and that my sincerity was most heartwarming to say the least. He went on to advise me that as long as I convey the truth about what I know or do not know to various inquirers, in time, I should do Riverbank proud. Then he said, “Now let’s tackle those questions.”

After each question, Hale Sabine would chuckle ever so politely and then

... as those who knew Hale would expect, he responded in an explicit, detailed, and definitely informative manner.

Originally I had intended to omit the questions with my original answers — professional pride, you know. However, fellow ASA members who were aware of the questions stated that under the circumstances, it was a must and most appropriate. Their premise was that everyone has to start somewhere, and my introduction to acoustical testing is a classic example of the problems one could possibly face. If for any reason, any knowledgeable acoustician feels he or she must remind me of my lack of acoustical knowledge on that day over twenty years ago, please be kind.

Actually, those not aware of what the questions actually mean in regard to architectural acoustics will realize the dilemma I faced when entering the field. Thus, for what it is worth, here was my initiation and introduction into architectural acoustical testing:

The first question was from Al Shiner. "Where can I buy an ILG?" "A what?" I replied. "An ILG," he repeated. "Spell it," I requested. "I ... L ... G, an ILG," he stated. Not realizing that I was speaking to a knowledgeable acoustician, I replied, "It sounds more like a fish disease. Are you sure it has to do with acoustics?" "Yes, I'm quite sure," stated Al. I asked for his telephone number so that one of the other fellows could call him when they returned. Alas, my very first inquiry, and I failed. I can't believe I said that about fish. By the way, an *ILG* is a broadband reference sound source that was made by a company named after its founder, Robert Ilg.

The second question came from Keith Walker, then a U. S. Gypsum engineer, now retired, who asked, "What color is your noise source?" Because I was sitting in Riverbank's control room trying to figure what the mass confusion of instruments was used for. My response was based primarily on the fact that Don Williams had applied labels to certain pieces of equipment and right in front of me was the label "NOISE SOURCE." Thus, boldly and proudly I replied, "It's green with black knobs on it." Keith Walker replied in a very polite and courteous manner, "Oh, excuse me. I wasn't referring to the outside color of the source but rather the noise type color, pink or white, that the source generates. Sorry for not being specific."

Fortunately, I noticed that Don's labeled noise source had a pink noise-filter module on its output and thereby was able to respond to Walker by saying, "Oh! I didn't realize that's what you meant (ahem). Sorry, Riverbank's present noise type is pink." Although Keith did receive a correct answer, he did say, "I take it you're new at Riverbank." By now, professional suicide was my only recourse and for Riverbank's sake — if not my own — it would be best if I just took messages.

From Ron Moulder, then of Owens Corning, came the third question, "How high can you go before you have a flanking problem that would affect your sound transmission?" I replied, "I'm new and as soon as someone re-

turns I'll have them return your call." I wasn't about to mention that during my four-year tour with the U.S. Air Force I hadn't noticed any problems with my flanks or speech at any height. By now, I knew that that wasn't what Ron was inquiring about, and I'd better start learning about this crazy discipline fast.

For those who might not know, *flanking* describes alternative routes that sound might take to get from one side of a sound barrier to the other, such as through side walls, the floor, or ceiling thereby reducing the sound transmission performance of the barrier.

The fourth question came from another consultant, Bruce Davy. "What are the weight, height, dress, and shoe requirements for a lady floor-walker, and could I recommend one?" Since the only floor-walkers I knew were heavy men who worked in Chicago department stores, I told Bruce that I would have someone call him tomorrow.

For the unknowing, one method that was once used to measure the structure-borne (impact) noise transmitted through a floor-ceiling configuration was to have a 115-pound woman, wearing a cotton dress and size 7-1/2 shoes with 3-inch high heels, walk on the test floor and the sound-pressure levels were measured in the test room below. I was told that in one instance, the testing had to be postponed because the standard floor-walker had become pregnant. Also, supposedly, a policy written somewhere states that no human being can be considered a standard test specimen. Eventually, the floor-walker was replaced by a tapping machine that has five calibrated weights (hammers) alternately striking the floor from a prescribed height. You have to see it to appreciate it. It is a commercially available product. However, if you purchase one, be careful when taking it through airport security. The one and only time I took the machine into the field I had to fly. When entering the airport security station, the security agent asked me, "What is it?" I replied, "a tapping machine." "What does it do?" "It goes tap, tap, tap, tap, tap." Immediately the machine and I were taken to a nearby office. You should have seen the expression on their faces when after carefully inspecting it and taking safety positions behind a barrier, they allowed me to plug it in. The machine went tap, tap, tap, tap, tap, whereby I replied, "See! Just as I said." It took quite awhile before I was able to convince them of my sanity and the reasons for needing such a machine.

Getting back to the original discussion, the fifth question asked of me that first day was, "What do you have that behaves like a limp mass?" I wasn't about to touch that one, besides it sounded a little personal to me.

In an earlier chapter, I explained the Limp Mass Law as related to sound-transmission loss of a barrier. A true limp mass-type barrier is one that is preferably massive yet very limp and if allowed to hang freely (unrestrained), it restricts vibration when exposed to noise. It is considered a good sound barrier.

At this point, the sixth question didn't even phase me. It was Hale's favorite question, although he was laughing hard by question five, number six caused him to become hysterical.

A client, stated, "I am considering using my spray on products that Riverbank tested earlier this year in bathrooms; although I have data on a number one and a number two situation, do you think I should do a number four on the floor, or do you think a number seven up in the air is more appropriate or perhaps both? What is your expert opinion on this matter?"

I was not about to relate to the caller what a number one or a number two meant to me involving bathrooms, and it took a lot of will power not to ask what on earth were numbers three through seven. Fortunately, individuals such as Hale Sabine would come to my rescue. Oh yes, the numbers actually referred to various types of mounting for absorptive specimens that were incorporated by the AMA. Today, the ASTM uses letters.

During my conversation with Hale Sabine, he mentioned that he was now retired and had moved to Florida. After our initial conversation, he periodically called Riverbank to talk over various items or changes in acoustical testing, see if the old gang were still around, or check on my progress. He had inspired me to actually use, as my initial requisite of study, these six questions: If I fully understood their significance to acoustical testing, I would indeed have acquired some very usable and worthwhile acoustical knowledge. Hale was correct.

Conversations with Hale were always inspiring. We would discuss various issues, and he always managed to provide me with a wealth of information. One day, I was able to provide him with information about a particular series of transmission loss tests that I conducted that had resulted in frequency shifts that differed from previous results. At first, he thought that perhaps my deductions were the result of some incorrect conclusions and that I had better check certain parameters and recheck my calculations before expressing my findings to others. After I proved to Hale that I had already considered these parameters he had referenced plus I did a few additional tests to prove my conclusions, he confirmed my formulations were correct, but he pondered my conclusion for the moment. After we both agreed on what was actually happening in the wall, he concluded our discussion by first stating, "This was most inspiring." Then, he congratulated me by saying, "John, you have just graduated." As simple as his latter two statements were, to this day I feel most proud of the fact that Hale Sabine had accepted me as a fellow acoustician and gave me a verbal diploma from his school of architectural acoustics. In some ways, it is the best kind of diploma one can receive — from one's peers.

Hale Sabine would often ask if I had any unusual inquiries or findings. He realized that in many instances, I could not respond because of client proprietary reasons and accepted the fact most honorably. However, he always enjoyed my disclosure of what I regarded as strange, different or weird. One of

Hale's favorites was the question from a science teacher who apparently had been misinformed about the definition of decibels. Her question was, "Is it true that 130 dumbbells can cause you to go deaf?" If you stretch your imagination a little, I suppose that under certain circumstances if 130 individuals were designated as being dumbbells they could become violent and cause deafness. I suppose, as well, that under extraordinary circumstances, if, 130 dumbbells of the weight-lifting kind were dropped in a specific way, they could also cause deafness. In any respect, I clarified the teacher's question by stating that I believe she meant decibels, not dumbbells, and went on in great length about decibel levels and the threshold of pain (130 to 140 decibels).

Unfortunately, in my explanation about the development of the decibel unit by the telephone company, I did mention that deci meant one-tenth of a Bel. Later, I complicated matters by referencing the fact that distance was significant in regard to noise sources and that if one were in a bell tower, the noise level could cause deafness, whereas if one were some distance away, the same bells chiming might be regarded as serene and pleasant to the listener. Obviously, I was inserting the definition of noise and sound into my oral presentation. Noise is merely unwanted sound. I later realized that under the circumstances, by commenting on the unit bel, then a bell in a tower, I was confusing the caller. As I finished my response, the caller said, "How can I calculate the actual size of the section that I could remove from a bell that I have in my storeroom in order that I could show my class what one-tenth of a bell actually looks like and if I strike it ... sounds like? One hour later, I hoped that the science teacher was better informed. Somehow when I had finished, I had a much better appreciation of the often-stated expression, "I went to college to become an engineer and now I are one."

As they say, never assume anything. Sometimes, you might think you are stating something clearly but later suffer the consequences. For example in 1989, there was a caller who stated, "How do I determine the 'E' (error) factor for sound absorption?" I was at a loss trying to remember what kind of error functions appeared in certain texts that involved sound absorption. Realizing that the caller was waiting, I said, "Could you give me some more specifics because at the moment I am at a loss." He replied, "Don't you remember at the ASTM acoustical workshop, you said that the units of absorption are called Sabins, named after Wallace Sabine, minus the *E*, and I don't recall you saying how to calculate the *E*." I wanted to cry, except that apparently, I perpetrated this caller's problem. After explaining that Sabine is spelled with an *e* at the end and that the unit of absorption is spelled sabin with no *e*, which is what I was referring to at the workshop, the caller simply stated, "Oh! I guess I can't calculate the *e* factor then. Oh well, thanks anyway. Bye." Another expression came to mind, "What we have here is a failure to communicate."

In 1978 Hale Sabine agreed to be my technical reviewer on my Paul

Sabine–Riverbank history. My original task was to document the acoustic work of Paul Sabine when I stumbled upon the Wallace Clement Sabine files. Then, because of the great interest in Wallace Sabine, Riverbank was asked to document the work of Wallace Sabine. Now of course, we have a book that addresses the work of all three.

In any case, in 1979 I mentioned to Hale Sabine that I had finished compiling the Wallace Sabine files but because I used the files themselves as the story line, many gaps existed. Hale suggested that I contact Leo Beranek, who had quite a file on the life of Professor Sabine and perhaps could fill in some of these gaps. Indeed, what eventually developed was a coauthored article on the life of Wallace Clement Sabine that appeared in the January 1981, *JASA*. Leo Beranek's contribution in extracting and incorporating the technical highlights was significant. To have been tutored by Leo Beranek, Hale Sabine and so many others was an honor — as well as an education beyond description for which I am most grateful.

Although Hale Sabine and I had exchanged letters and discussed many issues at great length over the telephone, I never had the honor of meeting him in person. We discussed our first possible meeting in Miami during the then forthcoming ASA meeting in the fall, but as things turned out, it was not to be. Hale had just finished reviewing some material for these writings about the AMA, Kleinhans Hall and the material regarding the National Noise Abatement Council. I received his edited versions and telephoned to thank him, when I was informed that he had just passed away that day, a personal loss that will never be rectified fully in my own mind. I had so wanted to talk with him about many issues about Paul Sabine, the colonel, and Riverbank.

Hale Sabine was my first adviser in acoustical testing and continued to be an inspiration, as well as a technical reference source, until that day, October 11, 1981, when he just wasn't around any longer. His passing marked nearly a century of involvement by his family in the science of acoustics.

I had the great honor of presenting the Hale Sabine Riverbank story at a special session at the ASA Cincinnati meeting dedicated in his honor. In my presentation I stated,

So many of us involved in the science of architectural acoustics owe so much to the Sabines. What was started by Wallace Clement Sabine, carried on by Paul Earls Sabine and his son, Hale Johnson Sabine, continues today, but only because of the contributions made by these three dedicated, committed scientists.