Autobiographical Sketch of Harold Johnston†

Family

Thirty miles NNW of central Atlanta, Woodstock had a population of 420 in 1930, 419 in 1940. Its economy was based on cotton farming. In 1930 there were more horses, buggies, and wagons than cars. Across Main Street from the railroad line, our family home on a one acre lot included a garden, chickens, a cow, two pigs, and flies. I remember when the first paved road and first electric power for homes came to Woodstock in the 1920s. But before that...

In the early 1830s the Cherokee Indians were cruelly driven out of North Georgia. The land was split into 40 to 200 acre lots and given away by lottery to settlers. My maternal great-great-grandfather, Joseph Stallsworth Dial, born 1793 in South Carolina, moved into Cherokee County, bought lots as some settlers gave up and left, resold some, and accumulated over 2000 acres in what is now an Atlanta suburb. He built a large home on his big working farm, but there were no tall white columns. Before the Civil War, he lost some of his land in lawsuits and from taking on too much debt, but he did leave large acreage to his children. My maternal great grandfather, William Choice Dial, born 1826, was a captain in the Cobb Cavalry, and, as my grandfather lectured to me, "was wounded three separate times in the war and carried a Yankee bullet in his back to his grave" in 1902. Grandfather William Choice Dial, Jr., well dressed, handsome, and arrogant in his photograph at age 20, eloped at age 21 with Dollie Gresham, age 18. The newspaper in 1889 cheerfully wrote: "The parental veto amounts to but little where hearts are concerned ... love laughs at locksmiths." Thirty months later, Dollie died of pneumonia leaving Florine, age 15 months, and little Dollie, age 6 weeks. Florine Dial, my mother, was reared by her aunt Elizabeth Latham, who ran a boarding house for traveling salesmen and young working girls. In 1902, Grandpa Dial inherited and farmed 160 acres. He married again and became a heavy periodic drunkard. He sold half his farm and later lost the rest to the bank, except for his home. Later, the home burned down, and he moved to a small house in Woodstock, which my father bought and gave to him. At age 72 he died in poverty.

My paternal great-grandfather, Doctor Medicine Johnston, a tenant farmer, died in 1869, and my grandfather Doctor Medicine Johnston Jr. at age 14 had to take care of his mother and sister. He worked as a farm laborer and in the gold mines of north Georgia, borrowed $100 to buy a small farm, in time repaid the debt, and slowly increased his land to 300 acres. He changed his legal name to J H Johnston, no period after J or H. In 1888, he sold the farm and set up J H Johnston Co., a general store in Woodstock. In addition to the store, over the years he became a buyer and seller of cotton, founder of a small bank, land investor, and local patriarch. He boasted that he had gone to school only six weeks in his life, and he regarded college a waste of time and spoiler of the young.

My father Smith Lemon Johnston wanted to go to college and become a Methodist Minister, but Grandfather Johnston forced him not to go to college but to work in the family business. When he reached 21, my father paid his own way at Young Harris College for one year, but then he surrendered and became a partner in the J H Johnston Co. and, later, in the Bank of Woodstock and in the Cherokee Rope Mill. He was an extremely active Lay Leader of the Methodist Church and went to conferences one or more times every year. He laid down the law in the family. For serious offenses, he administered the lashings after he got home from work. My mother was an artist and scholar by nature, but was strongly limited in finding means to express it. She was a talented piano player, loved to read good books, and was serious about her ceramic art creations. A relative had promised to pay her way through a four year college, but when she was ready for college, he had died without a Will. Her Aunt and Uncle paid her way for two years to Georgia State College for Women in Milledgeville, and she taught school for a few years before marrying my father. She introduced her children to books by reading to them after they were six months old, and encouraged them to read for themselves later. Father and Mother resolved to provide college education for their children, and despite the depression, they did.

A defining event in my life occurred at age 13; I was sick with rheumatic fever, which caused some heart damage and permanently limited my physical activities. An uncle, a doctor, advised my father not to waste money sending me to college, because I "would not live long enough to get any good out of it." Fortunately for me, his and other doctors' diagnosis was not completely correct.

I have three brothers, each distinguished in his own field: Smith L. Johnston, Jr. (1918−2000) graduated from Emory University in 1939, worked in an Atlanta bank (1939−1942), Private to Captain in the U.S. Army (1942 to 1945), and over the years he became a partner of J H Johnston Co., president of the Bank of Woodstock, land investor, and local benefactor. Richard Johnston (b. 1923) received the B.S. Degree in Textile Engineering from Georgia Tech, worked for a time in a cotton textile mill, served in the U.S. Air Force (1943−45), and was Senior Research Scientist at Georgia Tech until retirement; he now lives in Atlanta. William Johnston (b. 1932) received the Doctors Degree in Veterinary Medicine from the University of Georgia, practiced veterinary medicine until retirement, and now lives in Woodstock.

In 1948, Mary Ella Stay of Cleveland, OH, and I were married. She graduated from Mount Holyoke College in Massachusetts. We have four children: Shirley (1951) majored in Chinese Language and Literature at Berkeley and also obtained the MA degree in Library Studies from the University of Chicago; Linda (1953) obtained her MD degree at Emory University; David (1956) has a Ph.D. in Physics from MIT; and Barbara received a masters degree in Philosophy from the University of California at Riverside. In 2000 we have six grandchildren: Linda's, Sara, Laura, Joseph, and Aaron in Virginia; Shirley's son, Bryce, in California; and Barbara's daughter, Liberty, in California.

Influential Teachers and Associates

The Woodstock Public School had grades, one through nine, but it had only four classrooms. Each pair of classes shared one room and one teacher; but Mr. Eugene Booth taught grades seven, eight, and nine in one room. Mr. Booth was an excellent

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teacher, tutor, and adviser. He would walk up and down the aisles of the classroom trying to inspire the students to study hard and to prepare themselves for further education. He urged preciseness in writing and speech: "It? What is it? 'It' can mean anything from a chigger's hind leg to the Niagara falls. Tell us what you mean."

I entered Emory University in 1937, and for three years I majored in English Literature. An influential teacher at Emory was Professor Mose Harvey, from whom I took a course in Modern European History. Instead of working through the textbook, which covered the period 1900 to 1932, Professor Harvey talked about the history of the previous week in Europe. Nazi Germany had knocked out Poland with their Blitzkrieg, captured Denmark and Norway, and launched Panzer divisions into France, isolating an entire British army. Some students expressed skepticism of Harvey's intensity and concern. Professor Harvey responded with words to the effect: "Germany is about to knock out France, knock out Russia next, and then turn on Britain. If the United States is fast enough, we will go to war to save Britain. If we are not fast enough, we will find ourselves alone fighting the German empire with all the wealth of Europe behind it. You are free to be skeptical now, but every one of you will either join the armed forces or be drafted within a year or two. Think about that." I thought about that and changed my major from English to Chemistry, which I felt would be more useful during the impending war. Knowing that I would be exempt from the draft, I did not want to be left out.

Professor J. Sam Guy was head of the chemistry department at Emory University, and he taught freshman chemistry. Professor Guy lectured enthusiastically, frequently pointed out industrial applications of chemistry, and made analogies such as: "If every molecule of sugar in a one-pound box of sugar was as big as the one-pound box, you could pack them in a freight train which would go to the moon and back five billion times." I completed a major in chemistry in one year, with exceptional help from Professor William Jones. As I approached the end of my senior year at Emory, I thought that I would get a job in some industry nearby. Dr. Guy, said, "No, you should go to graduate school." I did not know about graduate schools until he suggested it, and I asked him where should I go. He said, "Caltech. It's the best in the country. Shoot for the best," but at his recommendation I also applied to several lesser schools.

In September 1941 at age 20, I entered the California Institute of Technology as probably the greenest graduate student they ever had. I luxuriated in the fact that nerds were normal there. Caltech expected every graduate student to start research during their first quarter, and Professor Roscoe Dickinson accepted me as a graduate student. For several months Professor Dickinson had directed a secret war project. His work was behind locked doors in the Crellin Laboratory. At the end of the first quarter and after Pearl Harbor Day, I went to Professor Dickinson in December 1941 and asked to join his project. He asked me why I wanted to do so, and I gave a naive patriotic speech. He managed not to laugh and said, "No, your job is to take more courses, continue your education, and I may or may not call on you in the future." At the end of the second quarter, Dickinson called me in and asked if I'd still like to join his project.

When I got inside the project, I discovered that they were working on poison gases, that is, chemical warfare. I expected something more exotic. I learned that our gas masks were inadequate, we had ineffective protection against a gas attack, and our soldiers had to have better gas masks immediately. Using change of electrical conductivity in aqueous systems, Dickinson's group had developed an ingenious way to measure and record how fast a gas came through a charcoal filter. We tested several charcoals and many gases. Professor Dickinson was fiercely honest, scientifically and intellectually. He provided my introduction to research and to the ethics of research. When I accidentally broke a thermometer, which had been calibrated by the National Bureau of Standards, he gave me a stern lecture about wasting irreplaceable equipment during the war, including a memorable admonition: "When you are spending Government money, always think about how your actions will sound in a Congressional investigation five years from now." John Otvos, a third-year graduate student on the project, is an excellent teacher, and for two years he was my patient tutor in how to carry out day-to-day details in research. Dickinson and Otvos were two of my best teachers.

In the summer of 1942, the National Defense Research Council (NDRC) perceived the need to know how fast war gases travel and dissipate over various terrain. The work we got into was to explore, understand, and characterize the dispersion of gases in the real out of doors as a function of meteorological conditions. We developed a compact scientific instrument to measure war gases in the field, and we built micrometeorological instruments to characterize wind speed, vertical structure of temperature, and vertical turbulence. We tested our instruments in several regions of the Los Angeles basin and on dry lake beds in the Mojave desert; and we used our instruments with real war gases in Florida meadows and forest and in a Panama jungle. I remained in Florida as head of the meteorology department in the Dugway Mobile Field Unit of the U.S. Army Chemical Warfare Service. Bob Mills joined our project in late 1942, he became one of my best friends, and (at Stanford, 1948−1951) he was my second best and most influential (to me) graduate student.

By the time I returned to graduate school at Caltech, Professor Roscoe Dickinson had died. Professor Don Yost became my new research director, and I asked Yost for a research project. He said I should pick my own research topic, but he provided some hints. At a war surplus store, he bought a DuMont oscilloscope for $5, and he bought electron photomultiplier tubes and miscellaneous electronic supplies. Yost set up the oscilloscope on a central table in the laboratory and announced to his group in general: "Chemists should use oscilloscopes, not retorts." Clearly, this was a hint and a challenge. I came up with the idea of a stopped-flow reactor for measuring fast chemical reaction rates. From my literature reading, I listed, in order of my preference, three fast reactions that might be studied in this way. The first was to react permanganate ion with other species in aqueous solutions, the second was to react nitrogen dioxide with ozone to form nitrogen pentoxide, and the third I have forgotten. Professor Yost gave approval of the general idea. I showed him my list of possible reactions and began to amplify why I preferred the permanganate system. With no word at all he pointed to the reaction of nitrogen dioxide with ozone and then underlined it with pencil. Thus I became a gas-phase photochemist and kineticist with strong ties to atmospheric science, instead of an inorganic chemist doing kinetics with transition-metal complexes in solution. At this point Yost freely made suggestions, and he introduced me to Dr. Oliver Wulf, a research professor at Caltech. Oliver Wulf was an expert in the chemistry of ozone and the oxides of nitrogen in the laboratory and in the atmosphere. He was a chemist, physicist, and meteorologist. Wulf generously taught me how to prepare and handle ozone. Also he taught me about Sydney Chapman's mechanism for ozone formation and destruction in the upper

atmosphere, about G. M. B. Dobson's measuring ozone and its vertical distribution in the atmosphere by means of ground-based spectroscopy of scattered sunlight during sunset or sunrise, and about ions and winds in the ionosphere.

I taught freshman chemistry and did research at Stanford from 1947 to 1956. As an extra duty one year, I was advisor to freshmen chemistry majors. Early in the fall quarter, I met with these new students in a small classroom and talked about courses, laboratories, and other things. I invited them to join in a discussion. On the back seat of the most right-hand row, there was a handsome bright-eyed boy, who asked pertinent questions and made sensible comments. Later in my office, he told me he was a premedical student, and we sketched out together a typical four-year plan, subject to the Stanford policy that 15 units per quarter was the normal load, and noted the number of free electives he had. He wanted to take 20 units, and after some discussion, I approved. At the end of the fall quarter, he came to my office and said he had changed his major from pre-med to chemistry, and again he wanted to take extra units. I asked him what grades he had made, he said all A's, and of course I approved his extra courses. In his four years as an undergraduate student, he took at least 20 units per quarter, made all A's except for one B, and had completed courses for a major in either chemistry, physics, or mathematics. As an undergraduate student, he did research in my laboratory, and for one year he worked with me to get his Masters Degree at Stanford. He taught me more than any professor ever did, and we are still good friends. His name is Dudley Herschbach.

I am grateful to my graduate students for the many things they taught me, and to colleagues at Stanford and at Berkeley. I learned more than I contributed in joint publications with William Bonner of Stanford, and at Berkeley: Ken Pitzer, Dick Powell, Gabor Somorjai, Brad Moore, and Yuan T. Lee.

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