

## PREFACE

Samuel Colville Lind, the only native Tennessean to be elected to the National Academy of Sciences, was until 1957 the only member of that august body to reside in Tennessee. Thus, it seems appropriate that the Tennessee Academy of Science publish the Memoirs of Tennessee's most famous scientist and one of this Academy's most eminent members.

Lind led a full, productive, happy, and healthy life. The patience and understanding of his gracious and charming wife contributed to the attainment of his high stature and recognition. On January 24, 1965, they celebrated their golden wedding anniversary in Oak Ridge, where the indomitable Mrs. Lind still resides.

During his long fruitful life, Lind had many interesting experiences. He recounts some of them in his Memoirs which he completed in 1963. A few bracketed notations have been added to Lind's manuscript to bring it up to date and to include more literature references.

Lind met his death, at the age of 86, on February 12, 1965, in the Clinch River below Norris Dam while indulging in his favorite hobby, trout-fishing. His love of trout-fishing is illustrated by the following anecdote. One evening, about three years before his final fishing trip, he asked me to check his automatic reel which was malfunctioning. Lind accidentally triggered the mechanism causing the hook which was still attached to the leader to pierce his finger. He absolutely refused to allow me to cut the hook so as to remove the barb and extract the hook. He vehemently protested, "This is my favorite fly—only yesterday I caught my limit on it." We drove to the emergency room of the hospital where the surgeon, a friend of Lind's, was waiting. The surgeon also met with the same resistance when he started to cut the hook. Exasperated, the surgeon said, "O.K., Lindy, to hell with the finger, we'll save the hook," and it was removed intact. This was the fly Lind was using when he lost the battle with the fast waters of the Clinch.

Many of the members of the Tennessee Academy knew Lind personally and I am sure that all with a chemical background are familiar with his publications. His doctoral publication (1906) on the synthesis of HBr is a classical example in chemical kinetics and his rate equation is still in use. The unusual form of the equation was interpreted by Christiansen (1919) and Polanyi (1920) on the basis of an atomic chain mechanism.

Lind's scientific career was concurrent with the development of modern science. He entered college the year Roentgen discovered x-rays. Before he graduated, Becquerel discovered radioactivity, Thomson the electron, and the Curies radium and polonium. It thus seems fitting and proper that his major contributions to science were in the fields of radioactivity and radiation chemistry.

After post-doctoral research in radiation chemistry at Madam Curie's Laboratory in Paris and at the In-

stitut für Radiumforschung in Vienna, Lind recognized the importance of ions as reacting species in the radiation chemistry of gases and in 1911 published the first quantitative study relating products to ions. Some forty-five years later, high pressure mass spectrometric studies established the importance of ion-molecule reactions in the gas phase, substantiating Lind's postulate which had fallen from favor for about twenty years.

Lind and his group from the U. S. Bureau of Mines extracted 8½ grams of radium from Colorado carnotite, the first radium produced in the United States. During the production days, an accident (not of Lind's doing) caused him to inhale some radium chloride dust, some of which permanently remained in his body. No harmful effects of this accident were ever noticed. However, the thumb and index finger of his right hand, due to picking up radium capsules, were burned to almost half normal thickness. A decrease in sensitivity in these two digits was the only effect he noticed.

Of the radium extracted, ½ gram was retained by the Bureau of Mines and was made available to Lind for experimental purposes. This half gram of radium followed him wherever he went and was still in use at Oak Ridge National Laboratory, where he was a senior consultant, until his death. The radiolytic reactions most extensively studied by Lind were the synthesis of water from its elements, the polymerization of acetylene and the effect of additive gases on reaction rates.

He authored "The Chemical Effects of Alpha Particles and Electrons" which was originally published in 1921 and revised in 1928, and his more recent monograph, "The Radiation Chemistry of Gases" (1961). He co-authored the volume "The Electrochemistry of Gases and Other Dielectrics" (1939). In addition to his research and other duties he was editor of the Journal of Physical Chemistry for 18 years. Lind was the author or co-author of over 140 scientific papers, the first of which was published in 1903 and the last in 1964.

The following incidents are indicative of the man as I knew him. At lunch one Monday during his seventy-fifth summer, he was grumbling about getting old. He stated that on the previous day after playing only nine holes of golf he became too tired to continue. However, he neglected to consider that on Saturday he had spent most of the fourteen daylight hours wading the fast waters of the Little Tennessee to get his limit of trout.

Nonetheless his recuperative powers were amazing. One Saturday during that same summer we fished Hazel Creek in the Great Smoky Mountains for about twelve hours. When we got back to the boat to return to Fontana Village, we were both exhausted. He retired immediately after eating supper. At six the next morning he was at our cottage for breakfast and raring to go up Hazel Creek again. Although I was over thirty years his junior, I was not up to another day on Hazel Creek. We compromised and cast from the boat.

The many honors which accrued to Lind testify to

his preeminence as a scientist, teacher and administrator. The esteem and affection with which he was held by all his associates and friends are mute evidence of his humanism, humanitarianism, and helpfulness. He had a delightful sense of humor and was never averse to a joke on himself. Although he enjoyed a good scrap, he never held a grudge. His only criterion for friendship was a common interest. His friends ran the gamut from backwoods natives that he met on his fishing trips to Nobel Laureates that he met at scientific meetings. To have

known him was to be impressed; to have been a friend of his was an honor. His death was a great loss to his friends and associates. We do, however, have the consolation that, both literally and figuratively, Samuel Colville Lind died with his boots on.

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## AUTHOR'S PREFACE

The writer of a memoir is hardly the one who should attempt to characterize it in a preface, since he is not only the author but largely its subject. I therefore feel inhibited and shall restrict my remarks to a few factual statements.

In this modest undertaking I was quite aware that its readers will be interested less in me and my work than in the places where it was carried on and in the distinguished and interesting people with whom I became acquainted. The period of time covered is 1902-1963. It was physical chemistry that first attracted me and later nuclear chemistry, particularly that branch that has come to be known as *radiation chemistry*.

The text is interspersed with incidents and personal experiences. While many of these may seem to have little connection with chemistry I hope they will help to enliven the picture I try to give.

The personal background of the writer is offered in chapter one where the description of his family and of his birth place may be passed over by those not interested. The treatment in the succeeding chapters is largely in chronological order and is mostly limited to the time when I was resident in the scenes described.

A description of the places where I have lived and worked seems a natural setting for the main theme but sometimes may stray rather far afield as the reader will find.

## CHAPTER 1

## MY FAMILY AND MY YOUTH IN McMINNVILLE, TENNESSEE

Before beginning to describe my scientific work in the field of chemistry it may not be out of place to give some personal background of myself and of my family. Born in McMinnville, Tennessee, June 15, 1879, I have wandered far from my native heath, imitating my Swedish father, but not my mother Ida Colville, whose family had lived in Tennessee before its founding.

My father, Thomas C. Lind, was born in Stockholm in 1842 where he received the usual education through Swedish high school, which like German Hochschule, includes subjects midway between American high school and the first two years of college. At the age of 16 he shipped as sailor on one of his uncle's small freighters and made a round trip to New York. On returning to Sweden he completed the required military training and performed his first term of service. At nineteen the wanderlust struck again and took him back to New York, this time as first mate of a sailing vessel. But instead of returning home, he enlisted in the Union Army just as the Civil War was beginning and troops were being actively recruited. With his Swedish military training, he rose rapidly to the rank of Captain and was put in command of a company of Negro troops, because as a Swede he had no race prejudice. After being wounded

in the Battle of the Wilderness, he was hospitalized in New York City for recuperation, after which I have no information until he turned up in Tennessee in the 1870's, where he was sent by the old Pennsylvania Oil Company to hunt for petroleum in the Southern Appalachians.

McMinnville was chosen as prospect because the Barren Fork River there, at low water, shows a continuous bubbling of natural gas which was thought to indicate underlying petroleum. His drilling disclosed none, and to my knowledge none has been found in the Southern Appalachians. [Oil has recently been discovered in Scott County, Tennessee].

After this disappointment my father decided to settle in McMinnville and study law. As there were practically no law schools in the South at that time, law study consisted in "reading law" in the office of an older member of the bar, usually a judge, until admitted to practice by state examination. Judge Webb, with whom he began to study, was a wise choice since he was an able barrister with many years of experience both in practice and as a circuit judge. He took much interest in my father's training and gradually began to impose confidence in him as an assistant. This relation became more impor-

tant to the judge as with declining years his health began to fail, especially his mentality. He would be seized with temporary aberrations which in time became more serious. He was obsessed with spells of violence and once imagined that my father was an enemy and made threats to kill him. Finally it was necessary for my father to sever their relation and set up law practice for himself.

Practice of law in those days was a respected, but by no means easy, profession. By custom and common consent, a country lawyer took cases in his own county and in the immediately adjoining ones. Many of the cases then were suits about ownership of land, arising from the aftermath of the Civil War and, of course, often involved lands extending into more than one county. Warren County, of which McMinnville is county seat, was named for the great hero of the Revolutionary War. It has the singular distinction of being the roundest country in the entire United States. On a map of the state showing counties, it looks like a penny, perfectly round except in the northeast corner where it is bounded with some irregularity by the Caney Fork River. The history of this circular boundary goes back to the time when Tennessee was separated from North Carolina and admitted to the Union in 1796. Many of the pre-existing counties were too large for horse and buggy travel to the county seat. As the counties were divided into smaller ones, a county seat would sometimes be placed far from the county center. To avoid this, a law provided that in the dissection of large counties, no boundary should come closer than 12½ miles to the county seat. Apparently Warren County was mapped by putting one point of the divider on McMinnville and describing a circle of just 12½ miles radius. There are vestiges of this procedure in a few other counties in Tennessee, but none in the entire United States is so nearly circular as Warren.

In going from one county seat to the next where a circuit judge would be holding court, it was necessary to travel by horseback, in an open buggy, or in a so-called "buck-board" without shelter. One must admire the fortitude of lawyer (and horse) who braved those twenty-five mile trips in the midst of winter over the worst of roads. Such was the practice of my father for thirty years until his death in 1903. Private automobiles had not then arrived, though he had once ridden in a taxi in Nashville.

Besides meticulous care of his law practice, he had always been an ardent member of the local "lodges," the Masons and the Odd Fellows. He was highly esteemed by all his acquaintances despite his foreign birth and the well-known fact that he had fought against the South. He was an Elder in the Presbyterian church and known for honor and upright behavior in all his relations.

I had an example of the affection in which he was held by the mountain people of Grundy County where he also practiced. Some of us "summer boys" were loafing around the Beersheba Springs Hotel trading with the mountain boys for watermelons when one of the boys slipped around to me and whispered: "We'll let you have it for less. For you are one of us." I was

proud to be considered one of them despite my association with city boys, some of whom would have thought this a doubtful honor.

I once had another proof of the affection the mountain people had for my father and which they often sought to transfer to me. One of the old timers drew me aside at Beersheba and confided that he was about to leave for Texas. I did not ask him why, for it was not always wise to inquire too closely into the reasons for sudden departure for Texas. I had even heard a rumor that such might be so in his case. He told me he had long known my father and had a great fondness for him. They had the bond of fellowship in the Masons. For this reason he would like, before he left, to see me become a Mason. He explained that their rules strictly forbade solicitation of members, but he was violating them by making an exception for me on account of my father. I thanked him warmly for his solicitude and promised I would give it careful consideration. But the closest I have ever come to membership in any fraternal order is in the Oak Ridge Lodge of Elks.

Some time before the Civil War, Beersheba Springs, atop the Cumberland Mountains, became the mecca of summer refugees from Louisiana and other southern states seeking to escape the annual ravages of yellow fever, before mosquitos were brought under control. A large two-story hotel overlooking the valley housed the health seekers and afforded the usual recreations, dancing, horses, cards, billiards, etc. Cottages also housed summer residents from Nashville, Clarksville and other Tennessee cities.

Through his law practice my father had become acquainted with Mr. Hooneywaddle, a Swiss settler who had acquired American citizenship, and built a Swiss-type chalet one mile from the Beersheba hotel, which was humorously known as Dan, from the biblical association. I mention Dan because my family and I spent two summers there, renting from Mr. Hooneywaddle who was then serving as American consul in Maracaibo, Venezuela. Our rent was probably in lien of payment for legal service rendered to Mr. Hooneywaddle by my father.

With the advent of the automobile and extinction of the mosquito in other places, Beersheba has greatly changed. The hotel has been converted to a denominational summer school. Youngsters are now too healthy to need mineral water, which has also lost its appeal to older people. The spring and billiard parlors are closed. A few descendants of the original cottagers still maintain their places for summer use. But the glamor of the once famous summer resort has vanished.

My mother, Ida Colville, came of Scotch-Irish descent. The family had been in America for more than two hundred years, migrating southwestward from Maryland, Pennsylvania, Virginia and Carolina to Tennessee. Her mother, Amanda Colville, was born in Athens, Tennessee, and married Samuel Lusk Colville of Warren County, who then made their home in McMinnville, where my mother was born in 1853. My mother was the third in a family of three girls and four boys. She was educated in public and private schools of McMinnville. She was about twelve when

the Civil War ended and related that she and other girls would sit on the fence and "sass" the victorious Yankee soldiers marching by. Her father, however, was not a too ardent Confederate. Long before the War he had freed the slaves he held, and like many of the more conservative southerners he had not favored secession from the Union and believed a war between the states would be a great mistake and as disastrous as it later proved to be. His conservative leanings did not make him popular with some of the stronger "Rebels." One of my uncles in his boyhood was chased home from a neighbor's and told not to come back "until the War is over." Later they became good friends again.

I was the oldest of five children. One brother died at birth. Our only sister, Amanda, my brother Robert and I all had simultaneously severe attacks of virulent diarrhea. Amanda succumbed, while Robert and I pulled through. My attack, though severe and lasting a week, was lightest. Robert was desperately ill, but fortunately neither of us suffered after effects.

Robert, beloved by all for his genial spirit and liveliness, was our father's favorite. Even the truck drivers would pick him up to ride just to enjoy his engaging company. He knew and liked every Negro in town and they all liked him. When Robert was six a traveling circus came to town. He was up at dawn to see them drive the first tent stake and on hand at midnight to see the last one pulled. But somewhere in the crowd he must have picked up a bad germ. He was stricken by what may have been the then unrecognized poliomyelitis and died of throat paralysis after a few hours illness. He left a sad family and his father never ceased to miss him.

My brother, Warner, ten years younger than I, grew up mostly after I had gone to college. He attended the Virginia Military Institute at Lexington after I had left Washington and Lee. Never married, he has spent most of his life in Kansas City, Missouri where he and our mother lived together for many years. Recently he retired from the Kansas City Structural Steel Company that he had served many years as Secretary. [Warner Lind died on January 3, 1968].

My own education was in the local schools beginning in my eighth year, previous to which my mother had taught me reading and arithmetic. Apparently she gave me up on penmanship, and I also became discouraged and have never mastered it. On completing high school in McMinnville at the age of sixteen, I took the entrance examination for Washington and Lee University which I entered in the fall of 1895. My going there rather than to the University of Tennessee, where three of my uncles had studied, was due to an influential school Superintendent who had graduated from Washington and Lee and who convinced my parents and me that it was the only respectable institution of learning in the entire South, if not in the country. But Washington and Lee began a new chapter for me and must also in this account.

But this chapter should not close without a word about McMinnville of 1895, typical of a small-town, county seat in Tennessee. Then already a century old,

the town had a population of nearly 2000. One school building housed all grades, four years of high school including mathematics through algebra, geometry and trigonometry, two years of Latin, English, history, etc., with no organized athletics, gymnasium, nor ball teams. Those were the days of earnest study and three hours of homework at night—no movies—no autos—not a public eating place in town.

The population of McMinnville, like that of many other towns in Tennessee, was and still is largely of Scotch-Irish descent. This designation refers, I believe, to people of Scotch origin who, on account of religious or political persecution, took refuge in Northern Ireland. Many of them emigrated to the United States, principally in the South. About twenty percent of McMinnville's population consisted of Negroes liberated from slavery during the Civil War. There were no Jews then except one couple without children.

Seven churches—Baptist, Methodist, two Presbyterian and one Christian for whites, and two for colored worshippers—Baptist and Methodist, cared for the souls of McMinnville's population. Four saloons operated openly and legally but were not patronized by the more respectable citizens—at least not openly, though, of course, there were back doors. I was never in one of them after the tender age of four and, needless to say, only once then. I was playing alone in our front yard on a mild summer evening when a strolling band of gypsy minstrels passed by. I was so enraptured with their music that I followed them all the way down Main Street and right behind them through the swinging doors into the first saloon, naturally their mecca. Drinking only their music, I was oblivious of my surroundings until I was rescued and snatched back to the world of respectability by some friend who had heard of my wanderings.

There are now no more saloons in McMinnville (boot-legging has replaced them as in most other towns in the state). My grandfather and two of my uncles never tasted anything alcoholic. The other two uncles abstained until they had moved away to city life and were then content with a single cocktail or highball, at home before dinner or in a respectable cocktail lounge. As to my father—he of course never drank at home, but it was rumored that when away at court he would sometimes indulge his old Swedish sailor or soldier habits. My mother was oblivious, or wisely pretended to be, as long as he observed the rules at home, which were rather severe. I remember when fishing he liked to clench an unlighted cigar between his teeth for hours at a time. There was no public drinking among Southern ladies at that time. They would not have been admitted to bars and if occasionally one drank in solitude it was highly secretive. Neither my mother nor my two aunts ever knew the taste, nor allowed a drop in their homes. As to myself, I never drank in McMinnville nor at Washington and Lee. It was not until I went to M.I.T. in Boston that I was initiated, but I had little time or money and not too excessive taste for it. Later in Germany one drank mostly beer or wine. But Germany comes later.