

## A Window into America's Paralytic Plague

*A First-Hand Account of the Disease*

*By Maurice Becker*

August 23, 1952. It is 2AM on a hot, humid night at Purdue University in West Lafayette, Indiana. I have been standing for hours at the laboratory bench working on a research project on lysozyme, a protein in tears that lyses (dissolves) certain types of bacteria. The research, if successful, promises to lead to a Ph.D. in microbiology. I'm exhausted and feel like I'm coming down with the flu. Shoving the racks of test tubes aside, I head for our student housing apartment in one of the sweltering tarpaper shacks that had housed military recruits during World War II. I plop into bed but can't sleep. I'm miserable, with a temperature, raw sore throat, and generalized muscle aches and pains. Is this the flu? I've never had flu with such severe neck and lower back pain.

The next day I go to the University clinic, where the physician on duty gives me a casual examination, and with a smirk of condescension, opines, "You may have the flu, but I suspect you're just trying to get out of exams. Take an aspirin (!) and go to bed".

The following day my back pain worsens and new alarming symptoms develop. My abdomen quivers violently and I can neither urinate nor defecate. I call our family physician. Without explanation, she orders immediate hospitalization to a nearby Catholic hospital. As my wife, Jean, does not drive, I prevail on a classmate to take me to the hospital.

While climbing the steps to the admissions office, my legs give out and my friend helps me as I struggle to get back on my feet. Why have my leg muscles failed? Are they paralyzed?

Suddenly it hits me. I have polio! I am one of the 58 thousand in America's biggest polio epidemic year of the twentieth century. On weakening legs, I limp to my assigned bed that reminds me of rugged camping days. The two-inch mattress on an unyielding slab of plywood offers even less comfort than a sleeping bag on unforgiving soil. I would have to endure this discomfort for eight months! The medical profession prescribes this type bed to keep the spine straight, thereby preventing scoliosis (curvature of the spine).

The first night as I lay there pondering my fate, something distressing happened that Jean didn't tell me about until weeks later, information that would have been difficult for me to bear at the time. It pertained to the family's first-hand experience with the terrible fear that gripped the nation for half a century.

When Jean came with me to the hospital, she had left our two children Sylvia, age three and Stan, age two in a neighbor's outdoor fenced play yard. The neighbor promised she would care for them until Jean came home. When Jean returned, however, she found the two children still outside in the dark, frantically calling for their mother. The neighbor having heard of my fate, completely abandoned them, fearing they would infect her and her whole family with the "Paralytic Plague".

Hospitals fostered this widespread fear by disallowing parents to touch or console their own children. Each time Jean came to my doorway to visit me, she passed by the children's ward.

She says she will never forget the expression on the faces of those grief-stricken parents unable to get close to their children who longed for just one loving hug.

At this point I digress to give a history of polio in the U.S. I am particularly qualified because I am one of the few people still living who not only experienced the paralytic plague, but also eventually set up diagnostic state laboratories for the diagnosis of the disease.

Polio is a disease of the central nervous system caused by a virus. Like all viruses, it thrives only in living cells and multiplies in a unique way. Once it has maneuvered its' way into a cell, it hijacks its' synthetic mechanism and converts the cell into a virus- producing factory. Within a few hours, the cell disintegrates, releasing hundreds to thousands of newly synthesized viral units, each capable of initiating infection in another cell.

When the poliovirus attacks the motor neuron cells of the spinal cord, it severs the lines of communication between the brain and the muscle activated by the specific neurons, resulting in paralysis. If the virus attacks the medulla oblongata in the bulb or base of the brain, the body loses control of vital processes, such as breathing, swallowing, pulse, blood pressure. In my case, bowel and bladder function were also temporarily paralyzed.

Contrary to the prevailing opinion at the time, less than 1% of polio infections resulted in paralysis. The outcome depended on one's immune status and the type of polio virus, of which there are three. During the first few days of an infection, flu-like symptoms are usual with all three types. Type two may cause weakness, but rarely results in paralysis, whereas types one and three occasionally cause paralysis or death, giving polio its fearsome reputation.

The first reported outbreak of a paralytic disease in America had occurred mostly in infants in Vermont toward the end of the nineteenth century. The culprit probably was polio. Then in 1909 Karl Landsteiner, famous for his discovery of the human blood groups, isolated the virus from infected nervous tissue. He used a special filter that blocked bacteria, but allowed viruses to pass through.

Polio hit America with a vengeance in 1916, with the first major epidemic occurring in New York City. Nine thousand cases were reported, with 2400 deaths. The high fatality rate can be explained in part by the unavailability of mechanical respirators, since iron lungs were not perfected until the late forties and chest respirators several years later. Most of the patients were under five years of age, giving rise to the descriptive term, “infantile paralysis”. Some adults and older children were also infected, however. As the century progressed, the age of onset increased and by 1950 a third of the cases were over ten. Polio was practically unknown in people over age fifty.

One famous American, President Franklin Delano Roosevelt was paralyzed at age 39 in 1921. Although his paralysis was similar to mine, he never fully adapted to his full-length leg braces and canes. He walked with companions at his sides as “stabilizers”, and when speaking, he often sat in a wheelchair that was deliberately made to be inconspicuous. It has been suggested that he hid the extent of his paralysis because of the common notion that physical handicap was associated with mental deficiency! In fact, many people held the irrational belief that polio victims were somehow responsible for their fate.

After the New York City epidemic, the incidence of polio increased rapidly in cities and communities throughout the country. By mid-century, 20 to 40 thousand cases were reported each summer, the season when most polio epidemics erupted. In efforts to stem the spread of the disease, local governments instituted quarantine measures, such as closing pools, gymnasiums, playgrounds, theaters and youth camps.

To limit the spread of the virus in my case, our family physician directed Jean to sterilize all my clothes and bedding in a tub of boiling water. It is unlikely, however, that this prevented infection of other family members because they had already been exposed through close contact with me.

Dr. Jonas Salk, known for the first effective polio vaccine, expressed a similar opinion when I met him a year before the National Vaccine Trials of 1954. Knowing that he had immunized himself and family with his vaccine, I asked if he would furnish enough vaccine to immunize my family. He declined, saying it was too late because they had already been exposed.

Polios, including those late in the recovery stage, were avoided “like the plague”. Parents even warned their children to cross to the other side of the street when approaching the home of a polio survivor.

Amidst all the uncertainty and fear, America clamored for a vaccine. However, research toward that goal was slow because experimentation required laborious, expensive and time-consuming tests in primates. Only when tissue culture techniques were developed in the forties could large

numbers of pure virus be produced, paving the way for the completion of the successful trials of Salk's killed vaccine in 1955, and the live vaccine of Sabin in 1962.

My personal battle with polio was just beginning. How and where did I contract this dreaded disease? I must have had contact directly or indirectly with an infected person. I knew of no polio case and had avoided crowds and public swimming pools. Why were pools implicated in the spread of the disease? Though never proven, swimmers who unknowingly were carrying the virus probably had contaminated the pool water. Swimmers in the acute pre-paralytic stage of illness could not have known they were carriers. During the stage of throat infection, swimmers may have added the virus to the pool water from their virus-laden saliva.

Following throat infection, the poliovirus travels to the gut and attacks the cells of the mucosa, or inner lining of the small intestine, thereby contributing billions of virus particles to the feces. Residues of fecal matter, especially from small children whose personal hygiene typically is a hit-or-miss routine, most likely contributed large numbers of virus to the water. Chlorination of pools did not necessarily kill all of the virus, due to the protective effect of fecal organic matter in which it was embedded.

My paralysis progressed rapidly. I monitored the progress by moving my feet, legs, hands, and arms; as paralysis was occurring. My ability to move them gradually diminished. Soon both legs were paralyzed-except for twinges in my left foot and big toe. The muscles of my arms and hands also were severely paralyzed. They would return eventually; but my legs were completely and permanently paralyzed.

The virus affects the motor nerves at random so that the paralysis is almost never symmetrical, thus the exact pattern of paralysis is different for each individual. Usually muscles on opposite sides of the body are not paralyzed to the same extent. For example, both legs may be paralyzed, but the toes or foot of one leg are not. Polio's 'crippling' effect, occurs when a strong muscle overpowers the opposing weak, or paralyzed one. The weak muscle slowly atrophies, causing shrinking and twisting of an arm, hand, leg, foot. When muscles on either side of the spine are affected unequally, scoliosis may result.

During those first few days, life-threatening symptoms of bulbar polio hit me. Until now, the virus had attacked only the neurons enervating my skeletal muscles—spinal polio. Now it was infecting the bulb of the brain, or brain stem. As much as I tried, I could not swallow. The nuns on the staff placed my head over the side of the bed, allowing throat secretions to drip into a pan on the floor. At about the same time, I noted some difficulty breathing. An iron lung was wheeled into the room.

At this point, despairing and fearful of dying, I asked myself the question often posed by victims of misfortune, "Why me?" An answer came from the hospital's soul-saving priest. Looking down on this wretched soul, he shared his medieval philosophy: "Our misfortunes are punishment for our sins." The crucifix hanging on the wall failed to console me.

Shortly after the priest's pronouncement, a neurologist specializing in polio gave me my first thorough examination. After confirming my extensive paralysis, he withdrew a sample of cerebrospinal fluid with a frightfully long needle. The lab reported a large number of

lymphocytes (large white blood cells), suggesting I had a viral rather than a bacterial infection. Undoubtedly, billions of poliovirus particles were also present in the spinal fluid, but viruses are too small to be seen through the standard light microscope; and the poliovirus is one of the smallest. It is a millionth of an inch in diameter. A typical bacterium like E.coli, is forty times larger. Viruses can be visualized only with the electron microscope, which was unavailable then except in research labs. Definite diagnosis of my case could have been done by isolation of the virus from feces and by demonstration of specific polio antibodies in my blood. Both require tissue culture techniques, then perfected by few laboratories. So the diagnosis was based on my paralysis and the large number of white blood cells in the spinal fluid. After careful consideration of my condition, the specialist concluded, "You could go either way." However, depression soon turned to optimism when my breathing and swallowing problems slowly disappeared. How lucky I felt that I had avoided a tracheotomy as well as imprisonment in that metal monster, the iron lung.

During the first week, paralysis of my trunk muscles, (abdomen and back), was occurring, though I didn't realize it at the time. In such a paralyzed state, I was unable to turn over in bed for six months. The abdominal muscles never returned and my back muscles were permanently weakened.

Trunk muscles are required to maintain balance while sitting, standing, or walking. Their role in balance became obvious about a year later while I was sitting without back support. Suddenly and uncontrollably I flipped over backward, banging my head on the floor. A lifeless mannequin would not have executed the maneuver more quickly or flawlessly. After that I avoided such

acrobatics with a passion.

Abdominal muscles perform functions that are not obvious until one is deprived of them. A case in point: Years later, while traveling with a group in Mexico, several of us suffered “tourists’ trots”, with its usual symptoms of diarrhea and vomiting. At our urgent request, the bus driver stopped at the nearest site with roadside bushes, which would provide a modicum of privacy. I could only contemplate how to satisfy the diarrheal urge; had I unlocked just one leg brace to squat, I would have plummeted to the ground in a heap. My more urgent concern was nausea, which had progressed to the retching stage. Violent retching produced no vomit, even after we reached our hotel. During the bulbar phase of polio, the virus had destroyed those neurons required for vomiting. Abdominal muscles are also used for elimination. To compensate, I must compress my abdomen manually.

During the first week, I suffered three other miserable symptoms: urine retention, bowel impaction, and painful muscle spasms over my whole body. The bladder problem was relieved by repeated catheterization. This led to urinary infection that was relieved by cranberry juice, brought to the nurses by Jean, the only person allowed visits. No contact with her was permitted. She was not allowed past the doorway.

The impacted bowels were not moved by the usual enemas, or by copious amounts of prune and sauerkraut juices. The nuns, familiar with caring for children, chastised me for “not really trying”. In desperation, they resorted to their special “blockbuster”, a mixture of soap and strong purgatives. This brought about a semblance of regularity after repeated doses.

The muscle pain resulted from the virus attacking nerves in the spinal cord that connect the brain to motor neurons. As those neurons in the spinal cord were destroyed, messages from the brain were disconnected, resulting in paralysis. The intense pain was caused by the inflammation in the spinal cord and felt like a horde of stinging ants swarming over my whole body. It is said that our memory of pain is fuzzy at best. On the contrary, I vividly recall this pain. Since the poliovirus leaves all sensory neurons intact, I still felt the intense pain resulting from the inflammation. Clinicians refused to administer painkillers for fear they would further damage the nervous system, already compromised by polio.

However, a drug-free strategy was available. It was the “Sister Kenny Treatment”. Miss Kenny was an Australian nurse who was given the title, “Sister”, in recognition of her service during World War I. Her treatment was best known for the application of hot, wet woolen blankets to affected areas several times daily. She learned the technique from Australian Aborigines who bathed the paralyzed limbs of their infants with hot wet cloths to relieve the muscle pain. Beginning in 1942, the procedure became widely available in the U.S. after she established the Sister Kenny Institute at the University of Minnesota. There her procedure was taught to nurses and physiotherapists from around the country.

Her treatment also required exercising the limbs immediately after paralysis. This contrasted with the long-held medical practice of complete immobilization of the paralyzed limb, even including the use of splints. Eventually, long-term studies of residual paralysis proved that immediate exercise yielded superior results.

The medical profession, despite Miss Kenny's urging, refused to abandon the long-held practice of immobilization after paralysis. She was not highly regarded by the medical profession, in part because she vigorously defended her erroneous theory that polio was a muscle disease, not one of the nervous system.

In my case, the hospital used the hot wool wraps, but refused me physiotherapy. Deprived of this treatment, my muscles were rigidly flexed so that my heels nearly touched my hips, and my arms, bent at the elbows, could not be straightened.

After three months in hospital, I had exhausted all my insurance. In fact, one of my two policies stated in fine print that polio was not covered. Now I must seek a place specializing in polio rehabilitation. I knew of one in Ithaca, NY since I had lived in Ithaca while a student at Cornell University. But how would I get there? My doctor refused to approve travel by car or bus, and train connections were non-existent.

My father-in-law, Melvin, an Ithaca resident, contacted a navy pilot who needed more flight training. In a few days, the pilot, with a medic landed in Lafayette. After loading an iron lung, they strapped me on my back to the metal frame of the gutted cargo plane. I was elated-but not for long. The vibrations of the prop engines caused such severe back pain that I cried out for a pain reliever, but to no avail. On arrival in Ithaca, I was transferred by ambulance to the famous Polio Reconstruction Home where I joined two dozen other recovering "polios".

This live-in clinic had existed since 1919 and was widely acclaimed for its intensive rehabilitation program. Physicians of several disciplines were available for consultation and

visiting teachers continued to educate polio-afflicted students.

Since my family was practically penniless, Jean found a job in a local store. Her parents helped care for the two children. An uncle gave Jean his perky '32 Chrysler coupe-with a rumble seat! She took driving lessons and eventually used the antique to get to and from work.

For the cost of my rehabilitation and care, I received aid from the State of New York and the March of Dimes, founded by Franklin Delano Roosevelt in 1938. This volunteer organization, plus many others, such as Rotary International, contributed several hundred million dollars for patient care, research, and development and testing of the vaccines. Herculean efforts through WHO to banish polio worldwide failed, but thanks to America's greatest peacetime volunteer program, the disease was officially banished from the Western Hemisphere in 1991.

Here in the Home, as in Lafayette, no one except Jean was allowed to visit me; and here again the same "plywood mattress" greeted me. Most of the patients at the home were polios. There was another adult patient who was afflicted with the Guillain Barre Syndrome. Unlike polio, his paralysis was symmetrical, though extensive; and both motor and sensory nerves were affected. Often this disease resolves almost completely in a few months. He left the Home with only an ankle brace.

Among the remaining patients, six of us were young adults, with severe paralysis. Three of us were prime examples of the commonly observed fact that the muscles used and stressed the most just before onset of paralysis, were the muscles most severely affected. In my case, I had spent many hours standing at the lab bench, and as one might expect, my legs and abdomen were

completely paralyzed, and my back retained only feeble strength. One man had spent all the previous day carpentering before he was paralyzed. His flaccid arms hung like pendulums at his side. Rehabilitation therapists had taught him how to swing his arms onto the top of a table or desk by a quick adroit twisting movement of his torso. With residual muscles in his right hand, he was able to write. On leaving the Home, he became a sales agent. Another young man, a farmer, had been tramping over the countryside hunting rabbits the day before onset. Both legs were paralyzed; he returned to farming after adapting to leg braces and planned to put hand-controls on his tractor. The two other adults were paraplegics. Unable to cope with the rigorous retraining required to walk with full-length leg braces, they left the home as they had arrived--in wheelchairs.

One young pregnant woman was enduring the confines of an iron lung, living with the hope of enjoying the little life soon to be born. Life in an iron lung must have been terribly frightening. The patient lay in the supine position, head resting on a platform outside the end of the metal cylinder. A snug collar encircled the neck to prevent leakage of air during the artificial breathing cycle. A vacuum cleaner-type motor was connected by a lever to leather bellows at the foot of the cylinder. Movement of the bellows outward decreased air pressure, causing the chest and lungs to expand, thereby drawing in air through the nose and mouth. On return to atmospheric pressure the process was reversed, resulting in the exhalation part of the cycle. The control of timing and volume of each breath was critical and specific for each individual in order to maintain the correct balance of carbon dioxide and oxygen in the blood. Because of this, as well as for other reasons, the mortality rate of iron lung patients was estimated at 70%.

The iron lung patient had to synchronize talking and swallowing with the pressure part of the cycle. That included swallowing while eating. Coughing was impossible. Personal care through a side port was challenging, especially when caring for patients who could breathe unassisted for only short periods. For some iron lung patients who could not swallow, a surgeon performed a tracheotomy by making an incision through the neck into the trachea. A tube inserted through the opening permitted removal of fluids and free access of air to the lungs.

During large local epidemics, some hospitals set aside whole wards of iron lungs, supplied with emergency power. These wards were monitored by a trained crew who responded to individual emergencies. For patients requiring long-term respiratory assistance, funds from the March of Dimes supplied iron lungs for home care until chest respirators became available.

As a newcomer at the Home, the most important and immediate item on the agenda was “stretching”, whereby specially trained physiotherapists forcefully increased range of motion of the rigid muscles a bit more each day. This painful procedure was necessary to establish degree of paralysis and to prevent “crippling” during recovery. After about two months, my muscles were completely stretched. Only then did I learn the true extent of my paralysis. Though my legs were completely paralyzed, I could still elicit a feeble response in my left foot and that persistent big toe. My arms and shoulders, however, offered definite promise. In fact, I could now, with difficulty, turn over in bed.

Having witnessed the amazing spirit and perseverance of teenagers and children in the Home, I vowed to conquer any barriers and challenges and eventually, despite any residual

disability, would enjoy a full, meaningful life.

In response to the Home's motto, "Use it or lose it!" I vigorously exercised my arms almost to exhaustion. The continued overexertion of my muscles over the next three and a half decades undoubtedly led to the debilitating effects of what is now recognized as the Post-Polio Syndrome.

Desirous of doing something constructive while recouping, I asked to be propped up in bed so I could spend some time dabbling in one of my hobbies: art. I painted a big picture of a bouquet and also drew a large map of Ithaca and adorned the connecting highways with painted sprigs of forsythia. The painting was made into a poster, as requested by the City Fathers, to promote Ithaca as the Forsythia City.

By the spring of 1953 my arms and shoulders had regained much of their original strength. Although my legs and abdomen remained completely paralyzed, I would walk again, but only with full-length leg braces and metal canes (crutches), plus a heavy dose of determination.

Because leg braces must be custom fit for each individual, a brace specialist took detailed measurements to guide him for his metal creation. He first measured the exact distances from my hip bone to my knee and from my knee to my ankle. This would tell him how to fashion the U-shaped leather-covered metal bands that would be attached to the backs of the main metal supports. At these points and at the knee, he attached leather

straps. At the knee he affixed a pad and straps. When all these straps across the front of the leg were tightened, my legs would be held firmly against the braces. Finally, he inserted a metal plate inside the soles of a pair of sturdy shoes. To these he attached stirrups, which permitted swiveling of the foot from the ankle.

To allow me to drag along the additional ten pounds of harness and to maintain balance required special aluminum canes. I was permitted to use only the Canadian or the similar Loftstrand types, with which one's weight is borne by the forearms, not the armpit. Metal cuffs attached to the tops of the canes helped maintain balance and permitted free use of the hands.

When my braces arrived, I looked at them aghast. How would I ever walk with those 3-foot long steel contraptions on each leg? The physiotherapist affixed a temporary corset at the top of the braces to give me the necessary balance and to prevent my buckling at the waist. Once I had mastered the use of my crutches and braces, the corset was discarded. We tightened all straps across the front of each brace, buckled the kneecaps, and locked each brace at the knee.

Now I was ready for the "launch". My therapist pulled me from the bed to the upright position, handed me my canes, and steadied me as I tottered on my two feet and two canes. Beads of perspiration covered my forehead as I looked down at the floor--so far away, so far to fall! I envied the confidence and resolve of a toddler who has just "found his legs". He pays little attention to his frequent tumbles; they are mere interruptions of his spirited excursions.

Now that I was adorned with my steel and leather harness, the therapists taught me several basic tasks. One was how to get down into, and up from a chair. Sitting down was relatively simple; just unlock one brace and let yourself go, making sure your hip hits the chair, not the floor.

Getting up from a chair required strong arms. With one brace locked, I turned around, facing the chair, and pushed myself up at an angle, hoping my foot would not slip. Once standing, I locked the other brace.

The most difficult task was stepping up onto a curb. (Curb-cuts were rare in those days.) Since I had no leg muscles for swinging my legs forward, I had to approach curbs from the rear, using my gluteus (hip) muscles, which thankfully I had retained. Swinging one leg backward, I planted one foot up onto the curb, and then pushed myself up with my hands on the canes.

How to negotiate stairs wasn't even considered in the curriculum. It required about three years to accomplish that on my own- provided the stairs had a railing to hold onto. Getting up or down stairs without a railing required several more years after I had developed the necessary strength, stamina and daring. Contemplating a flight of stairs as I looked down from the top was nerve-racking at best.

With these canes it is easier to negotiate steps without support rails. Even so, this maneuver is treacherous, especially when the steps are slippery. The two worst falls of my 38 crutch-dependent years occurred while descending stairs without handrails. In neither case did I break any bones. I ascribe this to the Home's advice on how to fall: "Just let yourself go, as if you were drunk; do not even try to break your fall". This advice could also save the bones of able-

bodied people, young or old.

In the late spring of 1953, I left the cozy life of the Home to rejoin my family, living with the in-laws. I had spent nine months in hospital and rehabilitation, a much shorter period than normally required for seriously paralyzed patients without access to professional rehabilitation programs.

Family responsibilities weighed heavily on me. I must buy a car; procure automobile insurance; install hand controls and learn how to drive all over again using my hands; and finally, get a temporary job for the summer.

The car we owned in Lafayette had died about halfway to Ithaca while Jean's Uncle Jack was driving it with its cargo of our belongings. Cause for its demise: a broken axle, plus other age-related maladies. Before relegating the old car to the local graveyard, Jack transferred everything to a rental car and then continued on to Ithaca. We did have a car given to us by my Uncle Ivan for Jean's transport to and from work, but this perky Chrysler coupe was too small even with its rumble seat. Melvin came to our rescue again and sold us his recent model Olds. I immediately ordered hand controls and with a mechanic's help, made the necessary adjustments for the Olds. Getting the necessary insurance was not easy; my former insurance company refused to reinstate me.

The third company I contacted did accept me but only after their representative had interviewed our former neighbors in Lafayette to confirm the extent of my disability.

They charged me extra because of my supposed risk. Now I was ready to learn how to drive, but the local Department of Motor Vehicles (DMV) refused me a permit...so I practiced on county roads at night with Melvin as my instructor.

Inexplicably, the DMV scheduled a road test without first issuing me a permit. The most difficult part of the test was turning around on a hill, a maneuver requiring tricky simultaneous control of the brake and gas pedal with the right hand. I steered with the left hand, using a knob fastened to the rim of the steering wheel. Unbelievably, I passed the test on the first trial!

My next project was finding a temporary job for the summer. I expected to be reinstated on the Purdue scholarship in the fall. Though the salary of \$3800 was barely enough to live on, it did however, allow me to spend full time on graduate studies and research. When a summer job did open up, it was through the kindness of another relative-my brother, Milford. He offered me the receptionist job at his animal clinic in Albany, NY. Within a week we were on our way. I drove the full 180 miles with my hand controls.

Using Milford's house as our base, Jean and I searched for an apartment. We found one in a nearby town, but it was up a flight of stairs. Nevertheless, the owner and his wife insisted we take a look at it. I'd never "done" stairs, but I valiantly began the climb, only to fall against the stairs at about the third step. A feeling of hopelessness seized me, not unlike the utter despair I felt a year earlier when polio was paralyzing my motor

neurons, one after another.

As I lay there crumpled up against the stairs, I began to cry. While Jean was helping me back on my feet, I noted the owner and his wife were quietly discussing something. I wondered what it was about, when presently he announced: “We’ve decided to let you folks take our living quarters downstairs. We will move upstairs.” Such acts of kindness, even sacrifice, have helped me to overcome the many challenges I’ve faced in the subsequent 5-plus decades.

The fall of 1953 found us back at Purdue at the same tarpaper shack we had vacated a year before, but this time it was different. The front steps had been replaced with a gently inclined ramp. Also within a few days I learned that the University had given me one of the most practical and considerate gifts imaginable: my very own laboratory. They had remodeled an area on the ground floor of the Microbiology Building and had furnished it with a serving cart. The cart was equipped with bicycle handbrakes to help steady me as I transported reagents and supplies around the laboratory. Finally, I was given a special parking permit to allow me to attend classes that were too widely dispersed for me to meet at my slow crutch-hobbling speed.

My research during the second and final year of my doctoral program was a continuation of my study of lysozyme. This protein, found in human tears, dissolves, or lyses a few species of bacteria that could cause eye infections. It has no effect, however, on most bacteria. The thrust of my investigation was finding ways to enhance the lytic action of

lysozyme on those species resistant to it. The results were so outstanding, that Purdue honored me with a financial award for meritorious research.

In the summer of 1954, I attained my PhD degree after only two years of study, and this did not include the nine months that was interrupted by polio. I was ecstatic! Now I would return as a professor to Florida State University. They had given me Leave of Absence and had promised to reinstate me after I had received my Doctorate.

But now, however, I faced a shattering reality. The University flatly refused to reinstate me because, they said, I could not handle the job, especially the lab sections. As this was 37 years before the 1990 law for disabled Americans, I had absolutely no recourse.

I immediately contacted classmates in their newly acquired positions, as well as Universities around the country, all with negative results. Especially humiliating was the rejection letter from Dr. Thomas Rivers of the University of Michigan, who was director of the 1954 Salk vaccine testing program. His comment was: "I prefer a vigorous young man." Would I have to relinquish my career in teaching? While pursuing advertisements in Scientific Journals, I came across an add for a virologist to set up a virus diagnostic laboratory for the State of Maryland. I knew little about virus diseases, and had not even taken a course in the subject, as the embryonic science of virology was offered in very few Universities at the time. I went to Baltimore for an interview and they were enthusiastic about my credentials and offered me the position. They said they would send me to various virus research laboratories such as those at NIH, CDC, and Johns Hopkins University to learn the special techniques. I accepted the position. In

a year I had established a State virus laboratory for Maryland; and what was the first disease I diagnosed? Polio! Within six years I was approached by the Michigan Department of Public Health. They offered me a similar position at a much better salary. This lab would eventually grow to include 16 technicians in virology.

In those early years after polio I developed more muscle strength in my arms and shoulders than I ever had during my previous years. There are two explanations for this. First is the growth of extra “sprouts” by unaffected nerve fibers adjacent to those paralyzed by the virus. These microscopic nerve cell endings automatically innervate those muscle cells orphaned by the paralyzed nerve.

A second factor is the constant Herculean effort I put forth over those years attempting to compensate for the huge muscle deficit resulting from the polio infection.

During this period I pursued several latent interests that I call “mini-careers” which made my early retirement years productive and exciting. One of my innate desires was writing science for children. Just after I retired in 1978, I responded to an ad for a science writer for the sixth grade. The editor and president of this company that publishes curriculum materials sold throughout the US, accepted my sample 6<sup>th</sup> grade lesson and hired me for the next fifteen years. I ended up authoring and illustrating five dozen lessons on topics ranging from Health and Nutrition, to Energy and the Environment. The royalties for these lessons helped sweeten my early “golden years”.

Another keen and abiding interest was learning how to play the electric organ. I bought a Hammond organ with the intention of adapting it for my use, despite my leg paralysis. One weekend, a carpenter friend and I devised “leg controls” that would be useful for anyone with extensive paralysis. This mechanism is described in one of several other publications I authored during my retirement. (Rehabilitation Gazette Vol 16: 53-55, 1973)

Of my avocations, art has been paramount. Even as a child on the family farm, I often spent evenings painting by lamplight; my bedtime limited by the amount of kerosene in the lamp. I took one watercolor course in High School and one at Cornell, but my artistic bent really bloomed after polio. During those years I completed a dozen art courses taken privately and at Community Colleges. As my artistic skills improved, I undertook several projects including teaching a course in Scientific Illustration.

I also have drawings of DNA and dinosaur bones on exhibit at the New Mexico Museum of Natural History. I illustrated a computerized program of plant identification designed by a botanist friend. I made Natural Science illustrations for a workbook used by the Albuquerque School System.

For about 20 years after 1952, I designed and sold wildflower and Christmas cards. In making the flower cards I pressed favorite flower petals using a pocket-sized press designed by a botanist and myself.

The most noteworthy accomplishments of my whole life are two murals, one 8 ½ x 20 ft- with a New Mexico motif; the other mural is a rendering from life of New Mexico wildflowers. For my artwork and other achievements, I was inducted into the New Mexico Senior Citizens Hall of Fame in 1999.

I had always wanted to see more of the world and did. With the family which had expanded to six, we traveled throughout the US, towing a camping trailer and saw many famous sights from Washington DC to the Canyonlands of Utah. Most tour leaders refused to accept me because they said I would impede progress of the group. However, thanks to a kind friend who was a world tour leader and to an organization specially geared to the handicapped traveler, I got to see world-famous sites in 21 countries. Especially memorable were Stonehenge, Chartres Cathedral, and Machu Picchu, lost city of the Incas.

I also joined University research groups as the illustrator on-site. These included an expedition to St. John Island studying epiphytes (air plants); also an Earthwatch dig at the Mammoth site in Hot Springs, SD.

As I write this account of polio, I have lost most of the strength I had gained in my arms and shoulders. These muscles began weakening around 1990, and are now so weak that I require help to get in and out of bed and on and off the toilet. This slow reversal of strength is known as the Post Polio Syndrome. Not recognized by the medical profession until the late 80's, it characteristically begins several decades after the original illness. It causes a gradual weakening of muscle strength as one reverts toward the original paralytic state. The cause has not been

definitively proven, but is not due to any residual virus as occurs in the case of chicken pox and shingles. This syndrome also has been reported to cause permanent changes in the brain. In my case, it has caused difficulty in recall of people and things and has increased my sensitivity to cold.

Whatever the future has in store, I am confronting it with faith, hope, and a healthy dose of optima. Having vowed I would never let polio defeat me, I accomplished more after my paralysis than I would have had I not been challenged by the Paralytic Plague.