A

Man

of the

Twentieth

Century

Dr. Ronold Wyeth Percival King

Dedication

To my parents in grateful memory of their advice and continuing encouragement in my long years of study.

Acknowledgment

I am most thankful to Beverly Griffin and Margaret and Barbara Owens for their knowledge and skill, which made this book possible.

A Man of the Twentieth Century

Table of Contents

The old church in Odiham, Hampshire, England, the village where William Colsell King was born.

Chapter I

Nova Scotia

My story begins in the year 1700 in the small village of Odiham which is located in southern England on the road between Stockbridge and Winchester with its magnificent cathedral. Odiham is so small that I was unable to find it on a map or listed in the index of the Encyclopedia Britannica. However, it does have a church that dates back to the year 1100. When I walked about in the adjacent graveyard, I was surprised to find that the names on the gravestones were predominantly King. Specifically, the names James King, Mark Wyeth King, Sarah King, Richard and Mary King relate to my family. My grandfather's name was James Wyeth King, my father's name was James Percival King, my name is Ronold Wyeth Percival King, my aunts' names were Sarah King and Mary H. King.

One King relative who is not buried in Odiham but was born there in 1770 was William Colsell King. After getting his Master's Degree at St. Mary's College at Oxford University, he was made a Deacon by the Bishop of Oxford in Oxford Cathedral in 1795. The following year he was presented to King George III by the Bishop of Salisbury in the King George Chapel Royal in St. James

Palace in Westminster. The Reverend W. C. King must have been a preacher of considerable distinction. On the back of one of the hand-written sermons, which has been preserved in perfect condition (and is reproduced here in Appendix A of the appendix), he wrote the dates and parishes where he preached. On July 5, 1795, he preached in Newnham and Northstake; on July 12, 1797, he preached the same sermon in Faringdon and Coxwell. He was curate of the parish of Coxwell.

In 1797, W. C. King prepared to travel to distant Nova Scotia for one year as an S.P.C. missionary and to become rector of the Parish of St. Paul in Rawdon and the parish of Douglas in Maitland, both in central Nova Scotia. He was promised a grant of land by King George III if he should decide to stay in Nova Scotia. It was no simple procedure to transfer the title of a parcel of the King's land. It was initiated by an inquiry to the Royal Surveyor in Nova Scotia as to what land was available. It read as follows:

> *(182) Rev. W. C. King, 562 Acres, Township Rawdon His Excellency Sir John Wentworth, Baronet Surveyor General of Woods in the Province of Nova Scotia and all other of His Majesty's Territories in North America.*

> *Whereas application has been made to me to grant a Certificate that a certain Tract of Land is not included within the Crown Reservation which said Tract of Land is situated and lying in the Township of Rawdon and within the County of Hants – containing 562 Acres, the same having been surveyed and laid out unto the Rev. William Colsell King as by the report of the Chief Surveyor of Lands in the Province of Nova Scotia dated the 28th of April 1802.*
>
> *I do therefore, hereby, certify that the aforesaid Tract of Land is not part of or included in district marked out as a Reservation for the Crown.*
> *Given under my hand at Halifax the 29th day of April 1802*
> *John H. Flieger, Dep. Surv.*
> *Warrant of Survey*
> *The Rev. Wm. King*
> *Escheated Land 500 A.*
> *p. 94*

This warrant was followed by the actual making of the grant:

> *GEORGE THE THIRD by the Grace of God of the United Kingdom of Great Britain and Ireland, KING, Defender of the Faith, and the United Church of England and Ireland on Earth the Supreme Head.*

To all to whom these Presents shall come: Greeting, know ye that we of our Special Grace, certain Knowledge, and mere motion, have given and granted, and by these Presents for Us, our Heirs and Successors, do give and grant unto the Rev. William Colsell King a tract or piece of land lying and being in Rawdon, County of Hants being the same lot (No. 46) originally granted to John Verk and which since, has been escheated and become forfeit and reverted to us for the non-performance of the terms and conditions of said grant by the said grantee. [Listing of boundaries omitted here] containing 562 acres more or less.
Plan 182
Rich. Geo Uniacke
Atty. General

Given under the Great Seal of our Province of Nova Scotia. Witness our trusty and well-beloved Sir John Wentworth, Baronet, Lieutenant Governor and Commander in Chief in and over our Province this 18th day of May and the 42nd year of our reign and in the year of our Lord, 1802.

Signed J. Wentworth

At the age of 26, W. C. King embarked from Plymouth on a large British sailing vessel. Happily, the year 1797 was a peaceful one between the end of the American Revolution in 1782 and the war of 1812 so that there was no

danger of being captured by an American privateer. However, the voyage was long and stormy and W. C. King was seasick most of the way. When the ship finally sailed into the sheltered harbor of Halifax and he stepped out on firm land, he decided never to go to sea again.

When he arrived at St. Paul's Church in Rawdon, the parishioners built him a parsonage at Nine Mile River. In 1799 he married Harriet DeWolf and three years later he was given the deed to the promised 500-acre tract of land. He and Harriet DeWolf lived in Rawdon for ten years with four children. After his wife died, the Reverend King moved to Windsor in 1808 to become Rector of the Cathedral Church of Christ. He was appointed Chaplain of the 2nd Battalion of the 8th Regiment of the King's troops stationed in Windsor by Charles Ingles, the first Bishop of Nova Scotia. He also accepted the position of Principal of the Academy now known as King's College School. He served there from 1808 to 1815. He married his second wife, Mrs. Elizabeth Gould, the oldest daughter of the Lieutenant Governor of Nova Scotia, Michael Franklin.

Reverend King became Rector of the large and historic Christ Church in Windsor in 1813. It is interesting to note that he preached the same sermon previously referred to in Windsor in 1831. This sermon is now on

Photograph of painting of Reverend William Colsell King (1770-1858). Great grandfather of Ronold King.

display at Christ Church. His wife died in 1817 and he married again for the third time, this time to Mrs. Anne DeWolfe. With her he had two children, Mary King and James Wyeth King. The latter became the father of James Percival King.

The Reverend William Colsell King died in 1858 at the age of 87. He and his three wives are buried in the old burial ground. The inscription on his tombstone reads: Sacred to the memory of the Reverend William Colsell King, AM of St. Mary's Hall, Oxford who departed this life the 15th day of Dec A.D. 1858 in the 87th year of his age. The deceased was a native of Odiham, Hampshire, England and came to Nova Scotia in the year 1797 where for upward of 50 years, first as Rector of the parish of St. Paul's in Rawdon and afterward as Rector of the parish of Christ Church, Windsor, zealously devoted himself to the sacred duties of the ministry. He died respected and esteemed by an extensive circle of relatives and friends.

James Wyeth King was the Director of Prisons in the Province of Nova Scotia. He lived in Windsor all his life. He inherited the 500-acre grant from King George III and built a house on it. The youngest of his four children was my father, James Percival King. He was born in the small town of Kentville, near Windsor, in 1874. He spent a happy and carefree boyhood in Windsor and

James Wyeth King, Director of Prisons in Nova Scotia.
Son of William Colsell King and grandfather of Ronold King.

the surrounding countryside. This was the lovely peaceful land of Evangeline with the low-lying fertile fields and pastures, friendly orchards, and gently rolling hills. It was a land that left deep and lasting impressions in the youthful heart and mind: here was nature, unspoiled and beautiful, with delicate blossoms in the spring, the scent of new-mown hay in the summer, and the crisp delight of big red apples in the autumn. Bordering and dominating all were virgin forests; the wide and deep flowing Avon; and the sea; the powerful, mysterious waters of the Bay of Fundy. To the growing boy, the deep, empty channel walled with red mud, the roaring, rushing bore, and the fast-rising, whirling waters were no novelty. Indeed, they were the scenes of bold exploits by a fearless youth in a canoe. It was from this background of natural beauty and adventure, from a father who loved fun and the out-of-doors, from a sensitive mother (Agnes, née Lovett) who tempered her affection with a measure of sternness, that he matured into manhood. His older brother Harry became a lawyer; his two older sisters, Daisy and Mary, got married. My father, always called Percy, was uncertain what to become. After attending King's College in Windsor, he took a pre-medical course at the University of Toronto. He received the A.B. degree at Trinity College in 1894 and the A.M. degree in 1896. After returning

to Windsor he prepared to set sail for England. He had enrolled in the Medical School of the University of Edinburgh, in Scotland. His first voyage across the Atlantic from Halifax to Plymouth was no less stormy than that experienced by his grandfather in the reverse direction. Unlike his grandfather, he was a good sailor and stood on the bridge with the Captain of the ship, when most other passengers were seasick. At the university he began his medical studies, but they came to an unexpected end. When he was supposed to begin work in the anatomy laboratory, he simply couldn't do it and forthwith withdrew from the medical school. This left him in a very confused state of mind. What should he do now? He decided to leave England and visit Germany.

Chapter II

Germany – 1

At the age of 22, young Percy King arrived in Germany. His pre-medical studies had required a reading knowledge of German, but he had never heard it spoken. Accordingly, his first priority after landing was to learn to speak and understand German. This he accomplished in a novel manner. He would sit on park benches where children were at play and talk to them. Next he attended lectures at the University in the city of Bonn on the Rhine River. He selected lectures in linguistics which not only provided listening to the careful pronunciation of a German University professor, but also gave an insight into the structure of languages. There are no detailed records of his activities in his seven years in Germany, interrupted only by trips back home to Nova Scotia in summer vacations. However, it appears that as he became fluent in the German language his interest in the subject of linguistics grew. In successive years he attended lectures on this subject at different universities where distinguished professors gave lectures on linguistics. These included the University of Leipzig in the city of Leipzig in southeastern Germany and the University of Freiburg in the beautiful Black Forest region of the

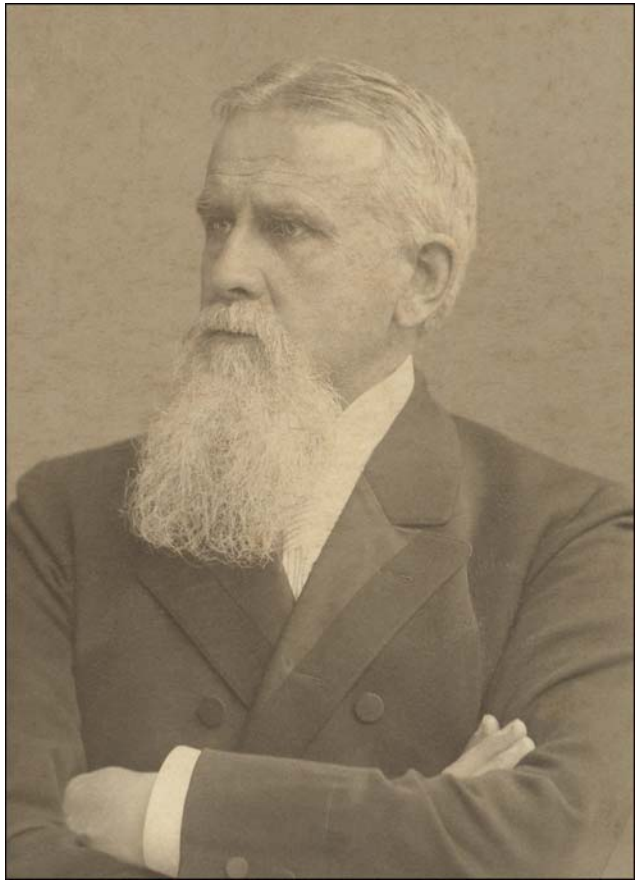
province of Wurtemberg. Here he enjoyed winter skiing in the mountains. Finally, he advanced his studies in Linguistics to such an advanced stage that he was able to write a Ph.D. dissertation on the evolution of a particular phrase from Sanskrit, through Greek and Latin, and finally through Anglo-Saxon to German and English. He earned the Ph.D. in the institute of a distinguished professor at the University of Tübingen. Tübingen is an idyllic town just south of the city of Stuttgart. It is located near the steep bank of the Neckar River in the midst of the Black Forest. As such it was also a favorite vacation area for residents of Stuttgart.

At this point it is necessary to digress and go back in time. In the City of Stuttgart a girl named Pauline Nell grew up in an attractive residential neighborhood. She was my grandmother. At a very young age she married a wealthy businessman named Karl Wagner. He was much older than Pauline. He owned a large and beautiful estate, complete with a mansion, stables, horses and carriages with servants and gardeners. They had several children. Karl died when Pauline was still young and attractive so that she did not stay a widow long but married a man by the name of Burkhardt. They had two sons of which the older stayed in Germany and died in World War I and the second, named Wilhelm, emigrated

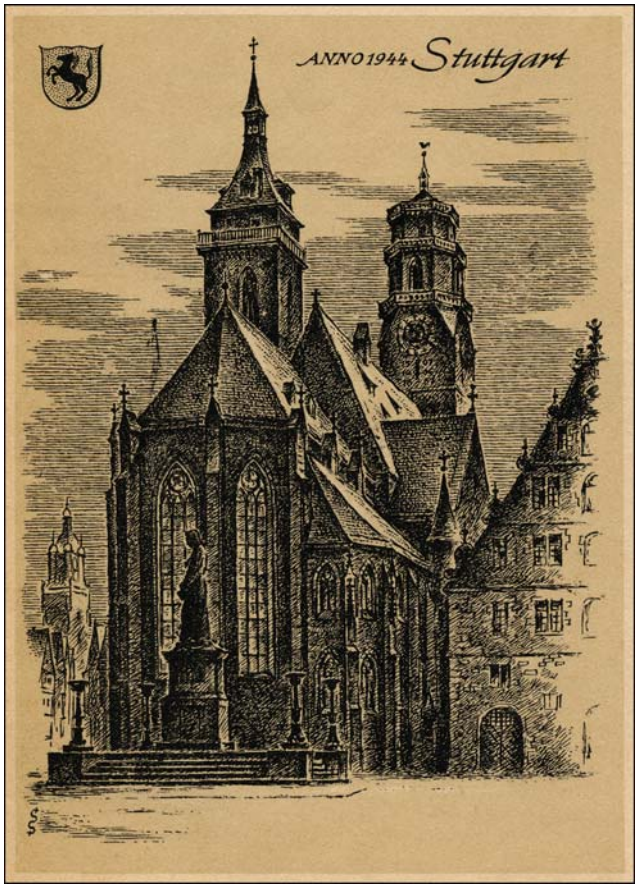
to the United States with his wife Gretchen. They lived in New York City all their lives and had two children named Alexander and Stephanie.

Pauline was again left a widow when still in her thirties. After several years she married for the third time. This time to Reinhold Seyerlen, the organist of the Cathedral Church in Stuttgart and Professor of Organ at the famous Stuttgart Conservatory of Music. Seyerlen was a direct descendent of Jurg Seyerlen, a world famous woodcarver of the 19th century who carved the choir stalls in the great cathedral in Ulm. Reinhold and Pauline had two daughters, the older named Irene, and the younger named Edith. Pauline died while the two girls were still in their infancy. Reinhold soon remarried to give the two baby girls an affectionate and talented stepmother in Hilde Fiedler. She was a locally well-known artist who traveled to many locations around the shores and islands of the Mediterranean to paint landscapes and village scenes. She also taught the growing girls to paint. Notably, Edith painted both landscapes and portraits.

Reinhold Seyerlen and his family enjoyed regular summer vacations in the lovely summer resort town of Tübingen just south of Stuttgart. Since Tübingen was also a University town in which many young men also enjoyed summer vacations, it was an ideal environment for



Reinhold Seyerlen, Organist and Professor of Organ in Stuutgart, Germany. Maternal grandfather of Ronold King.



Old postcard of Stuttgart Cathedral, where Reinhold Seyerlen was organist.

hiking, picnicking, and other social events that brought young men and women together. One such man and one such woman were J. Percival King and Edith Seyerlen. In due time, they fell in love and became engaged. A year later in 1901 when the Ph.D. had been awarded, they were married and in the summer of 1902 they left for the United States and a first job as Instructor in German at Cornell University in Ithaca, New York.

Chapter III

Williamstown

Crossing the Atlantic Ocean was uneventful for the happy young newlyweds. When they arrived in New York Harbor and stepped ashore, it was the first visit to the United States by a young Canadian and a young German. Percy, of course, spoke fluent English but Edith did not. She had studied English in school and in Ladies College, but was not able to converse in English. At home they always spoke German, a custom that continued throughout their lives. Since Percy had a position waiting for him, the couple immediately took the train that passed through the little town of Ithaca, New York, hidden in a valley. They rented a small apartment and Instructor King began his teaching duties in the German Department in the fall of 1902. They spent happy years in Ithaca. Cornell at that time was a relatively small university and they were delighted with its beautiful location high above Cayuga Lake. They enjoyed the students singing:

"High above Cayuga's waters
With its waves of blue
Stands our lovely alma mater
Beautiful to view"

It was a challenging experience for Instructor King to meet his first class of American college students. He had never taught before and now he was to teach a language he had started to learn only seven years earlier when he first went to Germany. He developed his own style of teaching. Unlike most language teachers, he did not view the class as a unit, but rather as a group of individuals. He was interested in each individual student and took continuing account of his problems in learning. He kept track of individual progress not only by daily recitations but also by short daily written tests. These he carefully corrected each evening and returned the next day. Students were required to study each day and not postpone it until the day before a monthly exam.

Halfway through the second year, Instructor King heard of a vacancy at Williams College in western Massachusetts. He applied for the position, traveled there for an interview and was duly appointed Assistant Professor of German, beginning in the fall of 1903. He completed the academic year at Cornell and then the young couple traveled to Ottawa, Canada, to spend the summer vacation with his much older sister, Daisy Sinclair. While in Ottawa, Edith gave birth to their first child, a boy named Rolf Egmont Percival King. Here the middle name Egmont was after Edith's half-brother, Egmont

Seyerlen, and the Percival was after his father.

Early in September the little family moved to Williamstown where they found an attractive house for rent on Glen Street. It was the third to the last house in Williamstown before Glen Street became Cold Spring Road and descended into a deep valley with a bubbling brook and a gradual green slope. This was the site of many family picnics. At the time there were no paved roads but the gravel surface was quite smooth since it was rolled hard with heavy steamrollers. The King family spent a very happy nine years in Williamstown. In September 1905, I was born and in December 1906 a third baby boy arrived and was named Lionel Detlev Percival King. He was always called Percy which caused some confusion because his father was also called that.

Since the salary of an Assistant Professor was not adequate to provide for a family of five, my mother gave private lessons in spoken German to a wealthy lady who lived in Williamstown. Actually there were many well-to-do families in Williamstown because of its unusual charm in the beautiful Berkshire Hills at the foot of the highest peak, Mt. Graylock. There were practically no stores in Williamstown and all major shopping had to be done in neighboring North Adams. This was reached by an electric trolley car that shuttled back and forth between

the two towns. Riding in the trolley was one of the early excitements for the King boys.

Mrs. King and her pupil soon became close friends and the lady took a personal interest in the King family. On bright summer days she would send her chauffeur to take the family for a ride in her automobile—one of only a half dozen in Williamstown. She was also concerned about the skimpy furniture which my father had been able to purchase. She gave the family a fine square piano and a matching mission set consisting of a desk, chair, and bookcase. The piano was especially welcome since it enabled my mother to continue playing after having taken lessons for years as a growing girl in Germany. After all, her father was a professional organist and pianist.

It was a pleasant custom at Williams College for students to drop in at their teachers' homes on Sunday afternoon for a cup of coffee and a piece of fresh-baked cake. Students in my father's classes were on a specially friendly footing with their teacher as a result of his teaching method and direct personal interest in each student. In time, this began to trouble the Head of the German Department, Professor Wahl. The whole department seemed to revolve around Assistant Professor King, not Professor Wahl. He began to question students and then to visit my father's classes to see and hear for himself

what the basis for the enthusiasm of the students could be.

Meanwhile, the King family of five had outgrown the Glen Street home and we moved to a much larger one on Park Street which bordered the Williams College Campus on one side. The house my father rented was beside St. John's Episcopal Church. It was a house designed for a well-to-do family with servants. The kitchen was in the basement and the meals were pulled up to the dining room above it with a dumb waiter. My mother soon learned to cook and bake, not only for the family but also for the Sunday coffee hour. Behind the house was a large open space where my father planted a garden to provide the family with fresh vegetables and berries. Here, on Park Street, we also had annual visits by a friend of my father's from his university days in Germany. His name was Ewald Eiserhardt. He very much enjoyed coming to Williamstown in summertime. We boys looked forward to his coming since he always brought us little presents. He did this in an amusing fashion. He always wore a large cape and he took all three of us under it. Then we were allowed to emerge from under it one at a time and reach into his deep pocket for the gift. He also hired a horse and buggy and took us for long drives in the beautiful hills and valleys of the Berkshires. He challenged all of us to

hike up Mt. Graylock, the highest peak in Massachusetts. We actually accomplished this and on the way saw our first rattlesnake.

After seven years of teaching at Williams College, my father was granted a sabbatical leave of absence. This would be, for my mother, a most welcome opportunity to return to her homeland which she had left as a young bride. I was almost four years old and our departure is one of the most vivid of my memories. My father had warned us that we would go by train and that it would come into the station puffing smoke and steam. This sounded very exciting and we looked forward to it as a great adventure. We were at the little station early and waited near the tracks for the arrival of the train. Finally, we heard a whistle and in came a monster so huge and so noisy that the three of us turned away and ran as fast as we could. The train was delayed in its departure for some time until our parents could catch up to us and bring us back to the station and the waiting train. My only other memory of the trip was on board ship. A large circus troupe was also going to Europe on the same ship. It included several families of dwarfs. Among these were full-grown men no taller than I was. On the long ocean voyage my father made friends with one of these handsome, in-no-way misshapen dwarfs with miniature

features. My memory is of this little dwarf sitting on my father's knee conversing in an animated fashion.

After the King family had returned to Williamstown in the spring of 1910, my father's problems with Professor Wahl soon came to a head. Professor Wahl insisted that my father's conversational style of teaching, especially in the more advanced courses, would have to change. He would have to adopt a more formal, lecture type of teaching. This interference in his teaching infuriated my father. He told me years later that he walked back and forth on Park Street after dark just to calm down. He finally decided to apply for the position of Head of the German Department at the University of Rochester in Rochester, New York, which was open. In due time the University of Rochester approved his application and he was appointed to be the Head of its German Department. My father then went to the office of the President of Williams College. Unfortunately, the President was himself on leave for the spring term of 1911. He was a man of national distinction named Garfield, a direct descendant of James A. Garfield, the 20th President of the United States. (Incidentally, James A. Garfield was a graduate of Williams College and was assassinated when on his way to attend the Commencement Exercises at Williams College.) Later, when President Garfield re-

turned to Williamstown, he wrote my father to express his regret that he had resigned without talking to him. He added that Professor Wahl was scheduled to retire at the end of the current academic year and Assistant Professor King was to be promoted to a full professorship and Head of the German Department.

Chapter IV

Rochester – 1

I don't believe my mother ever forgave my father for that fit of temper that forced her family to move from the Berkshires to the plains of western New York, from pretty little Williamstown to the streets of a large city. She left behind so many friends and so many happy memories. For her three little boys it was an exciting adventure. First a long ride in the train and then a new home—a house at 46 Vassar Street. My father had rented the house and sent our furniture ahead by freight while we lived in a friend's house in Williamstown.

Vassar Street was not attractive. The houses were small and close together, they had virtually no front or back yards, and there were no trees or shrubs. My brothers and I played on the street. Needless to say, my mother was very unhappy to have had to exchange beautiful Williamstown and our spacious home there for this depressing city street. Fortunately we stayed there only two years, but our leaving was due to another tragic event.

My father enjoyed his teaching and his colleagues at the university. However, as a newly appointed professor and department head at the university, he attracted at-

tention. This was an unusual event and was publicized in the city's newspapers. As a consequence he was invited to address the City Club, the Genesee Valley Club, and other organizations as an after-dinner speaker. Since his teaching had never been done standing up and lecturing but always informally, sitting at his desk in class and discoursing with his students, he found public speaking both difficult and nerve-racking. Before the academic year was over, he suffered a complete nervous breakdown and resigned his position at the university. The President of the university, Rush Rhees, was very much concerned and tried to convince my father to just take a term off. But my father said he was giving up teaching for good.

When my father's brother, Harry DeWolf King (who had become a lawyer and lived in Vancouver, B.C.), heard of my father's illness, he invited him to bring his family and spend the next year at his summer home on a small island, Gambier Island, near Vancouver Island. This was quickly accepted by my father. We put our furniture in storage and boarded the train for our long journey to the Pacific Coast.

Our train trip crossed into Canada at Niagara Falls and continued to the main line of the Canadian Pacific Railroad which extended across Canada from Halifax on the Atlantic to Vancouver on the Pacific. We climbed into

a tourist-class sleeping car which was to be our home for five days and four nights. Two large trunks were loaded into the baggage car. Our family occupied two upper and two lower berths. The upper ones were folded up in the daytime and the lower ones became facing seats with tables in the middle if these were desired. The Porter would bring sandwiches and various drinks from the dining car and my father would supplement these with what he could pick up in the station restaurant or neighboring stores. The trip was long and generally tedious. When there was anything to see, we looked out the windows; otherwise we played all sorts of games my parents had brought along. Scenically, the trip was varied. It began with fruitful farmland where we passed cattle farms with their red barns. Then came the seemingly endless prairies where there seemed to be nothing but grain fields with occasional stretches of desert. We made a long stop at Winnipeg where we were able to get out of the train and walk around in a small park near the station. As we approached the Canadian Rockies everything changed. The train started climbing. A second locomotive was hitched on to maintain speed. Finally, as the mountains became higher and the track steeper, the train entered the famous corkscrew tunnel in which it traveled a full circle and emerged at a much higher level. This interested us

boys very much. Finally we reached the Continental Divide and started descending. The train traveled at high speed on the edge of two gorges high above foaming rivers. First it was the Thompson River with deep green water, then the Frasier River with brown muddy-looking water. Finally, we reached the Pacific at Vancouver where my father's brother, Harry DeWolf King, met us at the station.

Chapter V

Gambier Island

At this point it is necessary to make a diversion and relate what happened to my father's brother and three sisters while he was in Nova Scotia, Germany, and the United States. His oldest sister, Daisy, married a man named Sinclair and settled in Ottawa. The middle sister, Mary (always called Millie), married a man named Gregor Wainwright and settled in Halifax. The youngest sister, Sarah (always called Sue), never married and spent much of her life visiting and staying for several weeks at the homes of her brothers and sisters. She was like another member of the family when she came for a visit. My father's brother Harry became a lawyer in Vancouver where he married a woman named Sadie Colville. They had two daughters: Agnes, just between me and my older brother Rolf in age, and a much younger daughter, Virginia. My uncle was quite well to do and had purchased a beautiful strip of land on a small island near Vancouver Island. It was named Gambier Island. The land sloped gently down to the sea where it ended at a long bay in from the ocean. A small brook flowed down on the land from a wooded area at the top of the hill. The property had been divided crosswise by a fence surrounding the upper part. This was

the pasture for two cows and contained a small barn and a chicken house enclosed in a separate fence. Also enclosed in a separate fenced area was a large garden that contained potatoes, beets, carrots, and lettuce, as well as raspberry bushes and strawberry beds. Adjacent to the fenced-in area was a two-story house containing two upstairs bedrooms and a kitchen-dining room and living room downstairs. In the wooded area bordering one side of the property stood a small shack where the caretaker lived during the summer when the family was on the island. Sadie and the two children stayed continuously while Harry came on weekends in his motorboat. Sometime later a much larger house was built closer to the bay. It had a large living room, a kitchen, and a very large dining room with picture windows toward the sea. Upstairs were three bedrooms. The caretaker now lived in the upper house continuously and the family in the new lower house. This was closed when the family was not there.

When we arrived in Vancouver in the early summer of 1913, the Harry King family was on the island in the large house. Harry was in town during the week and picked us up at the station. We stayed for a few days in the city house while my parents made various purchases. It was an interesting time for us boys since my mother took us out on neighboring Stanley Park extending along the

channel used by large ocean-going ships. These included the very large Empress Line that traveled to Australia, China, Japan, and Russia and also the Princess Line that went to Alaska and ports along the pacific coast of the United States. They were all part of the Canadian Pacific Travel Network. Since the channel into the Vancouver harbor was narrow where it passed Stanley Park, the huge ocean liners were very close and a real thrill to see for us boys.

After a few days in Vancouver, we all boarded my uncle's motor launch. This was long and sleek with four berths and a kitchenette. The cockpit was not large but had built-in seats so that we were all able to sit. My uncle stood at the steering wheel and the sliding controls above it. We left the harbor and motored through the channel out into the open sea. This was somewhat sheltered by distant Vancouver Island and many small islands so that our trip of slightly more than an hour was not rough. There were, however, some large waves that made us rise and fall as our sleek boat cut through them. When we entered the long, quite narrow bay on the southern side of Gambier Island, we were surprised by the steep bluffs and rocks that bordered it. My uncle's property was at the center of the bay and as he slowed the boat down it looked as if he were going to hit a big

bluff that protruded out into the bay. He steered the boat in parallel to the bluff and not ten feet from it. Here he landed at a long float that came out from the shore. He jumped from the boat, as did my father, each carrying a heavy rope tied to cleats on the side of the narrow deck. They fastened the ropes to cleats conveniently located on the float. The whole operation was most interesting for us boys and we quickly jumped out after the men. We didn't wait long on the float but scampered up the path toward the house. Halfway up we were met by a child our own age. It was our cousin Agnes. She was dressed like a boy, wearing rompers just as we were. Close behind her came a woman who looked surprisingly like my mother. She had the same figure, a very similar hair-do, and she wore the same clothes, a middy blouse and a blue skirt. It was my aunt Sadie. She greeted us in a friendly way and went on to greet my parents and invite them into the big house for a cup of tea. Meanwhile, Agnes showed us around. After tea, we all went up to the upper house which the caretaker had vacated for us. He moved into the old shack for the rest of the summer. We three boys moved into the one bedroom where we slept on cots. My parents occupied the other one.

Each weekend for several weeks my uncle brought all kinds of supplies that our family would need during the

winter. These included twenty-one chickens to supply us with eggs. They were specifically given to us boys; seven white Wyandottes to me, seven Plymouth Rocks to Percy, and seven Buff Orpingtons to Rolf. We also got a little white dog. To equip us for the long rainy season, each of us got a yellow slicker coat, a slicker hat, and rubber boots. We were surprised when, on one trip, Uncle Harry brought a load of lumber which he and my father promptly used to build an open deck on the front of the house so that we could sit there in the open and enjoy the view. During the rest of that summer, we three boys and Agnes had a most enjoyable time playing together and bathing in a neighboring beach. None of us could swim. Early in September, Uncle Harry made his last trip to the island and took his family home with him. Agnes had to go to school and he put his boat in a marina for the winter. Our family moved down into the large lower house and the caretaker moved back into the upper house. We were left to our own devices for the next nine months.

The King property was the middle one of three that bordered on Long Bay. On the one side the house was far away and we hardly ever even saw its caretaker. On the other side the house was quite close with a wooded strip between the two properties. Its caretaker was a friendly Japanese who made us strange-looking Japanese

kites that looked like large birds.

Winters on the Pacific coast are not very cold, but it is very necessary to heat the house and this had to be done with wood fires in the kitchen stove and an open fireplace. This meant that a great deal of wood had to be sawed and split. My father had to do this and we boys had to carry the wood into the woodshed behind the house. Western red cedars are very large and virtually impervious to rot. Numerous large logs were lying here and there in the upper pasture. They were remnants from logging operations carried out before there were any summer residents on the island. My father sawed into these logs with a six-foot saw, at one- or two-foot distances depending on whether the wood was for the kitchen stove or the fireplace. He then took the axe and split off slabs which he later split further into proper sizes. This was extremely hard work that required endurance and skill. My father also milked the cow and took care of the calf which had to be led from the barn to be tied to a stake at different locations where the grass was green.

For us boys the winter on Gambier Island was a wonderful learning experience as well as a happy playtime. We built and sailed little boats down the narrow brook, built water wheels at the waterfalls, found hollow stems to make pipes. We fed our chickens and watched them

lay eggs, which we carefully collected and brought to our mother. We learned to stay out of the pasture when the cow was out grazing since this particular cow disliked women and children and would chase them if they ventured within sight. We had a special tree to which we could run and quickly climb if we mistakenly thought the cow was in the barn. Actually, our days were carefully planned by our parents. We had play time and work time and mother devoted several hours each day to teaching us to read English and my father also took the time to converse in English so that we boys and my mother would get practice.

With regard to food, we had little meat but an abundance of milk, eggs, and vegetables. We had sacks full of flour, oatmeal, and cornmeal. My mother baked white bread, whole-wheat bread, and different kinds of cakes and cookies. We skimmed the milk to get cream and used this to make butter. My parents ordered things from catalogs and they were delivered once a week by the mail boat called the *Marine Express*.

All in all, the fifteen months on Gambier Island, and especially the time from September to June when we were alone, were most profitable for all of us. My father worked himself back to health and a calm and peaceful mind, and we boys learned much about nature.

Chapter VI

Rochester – 2

In the late spring of 1914 my father received a very cordial letter from President Rush Rhees inviting him to return to the University of Rochester and resume his duties as Head of the German Department. He assured my father that he would not be asked to give any speeches but would be able to devote full time to his academic duties. He further wrote that his year away would be regarded as a leave of absence and would be at full pay. The offer was quite unexpected and my father was surprised that it was even made. He had been so abrupt in his resignation. He did not wait long before accepting and thanking the president for his generosity. He clearly looked forward to getting back into intellectual work.

We spent a very happy spring and early summer. When the Harry King family arrived, we enjoyed many week-end picnics at attractive places on neighboring islands. Uncle Harry would take us by boat to a beach or flat rock near which we anchored and we then were rowed to the shore with a picnic lunch. Finally, in midsummer we had to pack all our belongings and be taken to Vancouver where we boarded the train for the long trip back to Rochester. This was quite uneventful and was carried out in the same manner as the trip west a year earlier. The trip over the Rocky Mountains was interesting for us boys since we remembered what was coming and looked forward to the most interesting sights, especially the Corkscrew Tunnel.

We arrived in Rochester in the midsummer of 1914 just as World War I began with the assassination of the Austrian Crown Prince in Sarajevo. We moved into an attractive house just two blocks away from No. 23 Elementary School. Our house was located at 19 Thayer Street. Next to us lived Professor J. R. Slater, Head of the English Department at the University. Diagonally across the street lived Professor A. S. Gale, Head of the Mathematics Department, and just around the corner lived Professor H. E. Lawrence, Head of the Physics Department. Thayer Street had beautiful shade trees and generally well-kept homes. The only disadvantage with our house was that it had only a small backyard. However, it did contain a fruitful cherry tree, which we enjoyed for its delicious fruit and for climbing by small boys. We were all highly pleased to move into our new home in one of the most attractive middle-class residential areas in Rochester.

In early September we boys faced a new and somewhat frightening adventure—school and days away from home. Our parents took us to No. 23 School and the principal,

a Mr. Hawley, assigned us to grades appropriate for our ages and the fact that we had never attended any school. I was put in Grade 2B where the teacher gave me a book and said look at the pictures. I not only looked at the pictures but read the accompanying text. When the teacher discovered I could read, she took me into Grade 2A where I stayed the term but was then promoted to Grade 3A, skipping Grade 3B.

When the summer came after one year in school, my father, who had worked hard at the university teaching, decided he needed a rest in the country. He took the whole family across Lake Ontario on a ferry and drove to a point of land known as Prince Edward Peninsula. Here we spent a month in boarding in a farmhouse. It was a very attractive place right on the lake and close to the famous sand dunes. The farmer had a very large house and easily accommodated our family. He also owned two large rowboats. We rowed these to a sandy beach a half-mile away. This was an unusual beach because it was enclosed in a sand bar at some distance from the shore. Between the bar and the shore the water reached a depth of about six feet. There was a narrow channel through the bar through which we rowed and landed on the beach. None of us boys could swim and our parents provided each of us with a pair of water wings with which we could swim

out to the bar and back. I decided I wanted to learn to swim. The method I used was to inflate the water wings a little less each day, until I finally swam with no air in them and discarded them. Meanwhile, my father helped with the farm work, chatted with other guests, and took long walks into the beautiful countryside. It was a little boring for my mother who didn't go in swimming and found little to do. The next year in school was uneventful and the following summer my father wanted to go back to McDonald's farm, but my mother said she would rather stay at home. My father decided to take us boys across the lake for three weeks. This time we stayed in a large tent behind the main house. We had a good time.

As the next summer approached, my father decided he didn't want to board at McDonald's farm again. He said he wanted to buy a farm for a summer place and this should be near the ocean. Accordingly, as soon as the spring recess at the university came, he took the train all the way from Rochester to the state of Maine. At that time, passenger trains went all the way up the coast as far as the City of Rockland. He had provided himself with numerous prospectuses from real-estate agents describing farms for sale and had arranged with them to expect him. When he returned, he told us that he had made the down-payment on an 80-acre farm, five miles out from

the little town of Waldoboro, Maine. He was very enthusiastic about the farmhouse and the land. He sketched maps of the property and especially of the waterfront on a long bay of the ocean.

In the middle of June 1918 our family packed and took the New York Central and then the Boston and Albany train to South Station in Boston. We stayed overnight at a hotel and then took a taxi to North Station, where we took the Boston and Maine to Portland and continued on the Maine Central. The most interesting part of the trip was when we arrived at Bath, Maine. Here the train had to cross the very wide Kennebec River and there was no bridge. In order to get across, the entire train was put on a ferry. There was room for two cars on each side and the locomotive in the middle between them. It was an interesting and time-consuming maneuver for the locomotive to push the cars on the ferry and then get on itself. The reverse operation took place on the other side. Finally, the train was reassembled and puffed onward, stopping at many little stations with strange names: Wiscasset, where it crossed the end of a shallow bay on a trestle, Damariscotta, Warren, and finally Waldoboro.

We were surprised when we got out of the train to see no town. There was a small station, and a horse-drawn wagon stood on the dirt road that ended at the station.

We climbed into the wagon and our baggage was loaded behind the seats. We traveled several hundred feet and then came to an intersection, which turned out to be the center of the town of Waldoboro. There was a grocery store at the corner and a drug store and 5 & 10 further across the intersection. We continued right through the town and passed a school and a factory that manufactured buttons. Looking down the steep hill on the right, we caught glimpses of the harbor. In it were numerous fishing boats. We were driven five miles over a very rough dirt road and stopped just beyond two churches, one on each side of the road. On the right side on a little knoll was a beautiful Cape Cod style house.

At this point it is convenient to interrupt the continuity of our summer trip with a description of the house and its immediate surroundings. The main building was built in 1830 for a man named Boyd Winchenbach. We met the last Winchenbach to live in the house: a charming old lady named Augusta Winchenbach and generally called "Aunt Gustie." She sold the entire farm after her husband died to a man named McCobb who was not a farmer but simply wanted to live there. The house contained all of the Winchenbach furniture, the woodshed was full of cut wood for wood stoves, and the barn was filled with hay in the lofts above the horse and cow stalls on one side

and above a place for farm tools on the other side. In the center was a wide area behind two huge sliding doors for a buggy, hay rake, and farm wagon. The back corner of the barn had a door that opened into the first of a row of three chicken houses that extended far back from the road. The farmer could walk from the house through the woodshed and the barn to the last chicken house without going outdoors. This was important in winter when the snow could be very deep. In order not to have to go outdoors to an outhouse, one was attached to the rear corner of the woodshed. It was elevated about six feet over the ground and reached by a similarly elevated walkway from a rear door into the kitchen. At the bottom of the two-holer was a large drawer-like wooden box on skids. It could be pulled out by a horse, dragged back to the hay field, and its contents scattered for fertilizer.

The rooms in the main house were symmetrically arranged with a large room on each side of the central chimney. One was the living room, the other the parlor, but the McCobbs had used it as their bedroom. Each extended from the front, back about two-thirds the distance to the back wall of the house. Behind the living room were two pantries; behind the bedroom was a small dressing room; and between these was a small room with one window facing back into the apple orchard behind

The farm in Waldoboro, Maine.

the house. There were small fireplaces in the bedroom and the rear room. The one in the living room had been walled over with lathe and plaster and wallpaper. The wide brick floor was, of course, visible and its width indicated a very large fireplace.

A door in the back corner of the living room led into the spacious kitchen in the ell. This extended the full width of the building with windows front and back. It had a built-in sink with a small hand pump at one end and a drain-pipe through the wall into the backyard at the other end. There was a full-sized black cook stove

at the center of one wall with doors on each side leading to an unfinished room. Finally, in the front of the living room there were two doors, the one leading into the cellar, the other into a very narrow front hall. Across the hall a door led into the master bedroom. On the inner side was a very steep stairway leading upstairs to two bedrooms. The outer side consisted of the very wide front door with wide panels in each side and a wide window above it. The front door opened onto a large block of flat granite and a narrow one beyond it as a step onto the front lawn and the shade of two large Linden trees. Those gave the name to the farm, viz., "The Lindens."

Now let me return to our arrival. After leaving the stagecoach, we climbed the mound to the front door which my father unlocked. We squeezed into the narrow hall and from it into the living room. This contained very little furniture, only a large round table and some kitchen chairs. However, after buying the farm, my father had ordered three folding canvas chairs and three folding canvas cots. These lay in large packages in front of the house. The folding chairs were for the living room, the cots for the rear room which was to become the bedroom for us three boys. In the downstairs bedroom was a beautiful black walnut queen-size bed which the McCobb's had left. My father had also brought some oil

lamps since electric power had not been made available on the entire road.

Living at the farm was complicated after city life. Water had to be pumped from a well and meals had to be cooked on a woodstove. Groceries could be obtained at the next farmhouse which had a small store squeezed between the barn and the house. The owner, Herbert Winchenbach, and his wife, Carrie, ran the store and the farm. They had a herd of cows and sold us milk and butter. We bought rolled oats, cornmeal, white flour and whole-wheat flour as well as eggs from them. My mother had to bake the bread. Meat was sold by a butcher who stopped twice a week and delivered what you had ordered on his previous visit. It was hard work for my mother.

One of the first things we boys wanted to do was to walk down to the shore for a swim in the little bay my father had described so enthusiastically. Two days after our arrival my father indicated the way and we three rushed ahead down the edge of the hay field. This narrowed and became quite steep at the edge of the woods. A gate consisting of wooden bars through holes in two vertical posts together with a fence separated the woods from the hay field. We opened the gate, ran through and down the narrow path into the woods. My father closed the gate and followed us. Soon we came to a swamp across

which the path continued on a narrow board. Then came the main woods with high pines and firs that continued for three-quarters of a mile down a fairly steep hill. At the bottom, the bay became visible and the path made a sharp left turn to follow parallel to the steep slope to the bay. Finally it turned right through a grove and ended on a smooth sloping rock next to the little bay. What a disappointment! The bay was completely empty: just a vast expanse of mud flats. We walked around the little bay, which was, of course, also just a mud flat, and along a rocky shore until we finally found a place where the water was almost three feet deep. Here we took a swim and then walked the mile back up through the wood and the hay field to the house. We decided never to go down again at low tide.

The next day we walked to the shore again in the afternoon at high tide. We found it easiest to jump into the water from the smooth sloping rock. The water was lukewarm since the sun had heated the mud flats and the water was warmed as the tide flowed in over them.

We spent a very enjoyable summer at the farm. My father started cutting down older bushes that had started growing into the hay fields and we boys worked hard helping him. Then when the tide was high we walked to the shore for a swim. The hard physical exercise and almost

daily long walks to the shore did wonders for my father. As September approached, he looked tanned and healthy and became restless to get back to his teaching, which he so much enjoyed. We boys were less anxious to get back to school. We took the train back to Rochester and my father promptly started working at his desk and walking to the university. We boys went back to school.

The academic year 1918–19 was uneventful. I graduated from high school at the end of three and a half years. My older brother Rolf was a freshman at the University of Rochester, and Perc was in high school. The most significant event was our family's move from 19 Thayer Street to 57 Brighton Street, which was up for sale and my father decided to buy. Brighton Street, like Thayer Street, was only four blocks long, but more attractive than Thayer Street since it was lined with large and beautiful Weeping Birch trees. The house was somewhat larger with a picturesque octagonal tower at one corner. The downstairs room had built-in bookcases with glass doors from floor to ceiling and the upstairs room was large enough to become a small bedroom for one of us boys. Instead of being squeezed in between houses within a few feet on each side and with a tiny backyard, the houses on each side were some twenty feet away with fruit trees between

King home at 57 Brighton Street, Rochester, NY.

them. The backyard extended some 200 feet back. The last thirty feet were fenced off and supported a trellis with two kinds of grapevines. Behind this was a large area on which stood a small chicken house complete with a fenced-in yard. The house was within easy walking distance to the university and not too far from East High School to which we rode our bicycles.

My father soon asked: Why have an empty chicken house? After our year on Gambier Island with each of us boys owning and caring for 7 chickens producing eggs for the family, why not have chickens in Rochester? He promptly bought a half-dozen hens and put them in the chicken house. He instructed us boys to care for them. Since my brothers showed little interest, I took over. It seemed an interesting hobby. So I studied in books on poultry raising what the best procedures were and what feeds to select including the importance of fresh greens in the winter. I also learned that in the winter the days were so short that the hens did not consume enough food to maintain egg production. The most important thing I learned was that just ordinary hens are very poor egg-layers compared to highly-bred strains. I decided that it would be best to dispose of the six my father bought and replace them with some of high quality. Unfortunately, high-quality hens were very expensive and way beyond

what I could afford with my limited pocket money. But there was a way out: buy day-old chicks. Accordingly, I put in an order for 12 white leghorn chicks to arrive in the spring. It is interesting that chicks could be sent by U.S. Mail specifically when they are one day old since the entire yolk of the hatching egg ends up in the chick's crop.

In preparation for the arrival of the chicks, I constructed a simple brooder. It consisted of an oval of cardboard about 3-ft long and 2-ft wide and a foot high. In the center I located a 100-Watt electric light bulb in the usual metal grid of a trouble light. I covered the grid with a black cloth so that it would emit heat but very little light. This made it possible for the chicks to keep warm but not have to sleep in the bright light. The entire assembly rested on a cardboard floor covered with coarse bran to absorb the droppings of the chicks. The Brighton Street house had a finished room in the attic which the family did not use, and my parents allowed me to have the brooder there. To provide water for the chicks, I bought a simple fountain at the store that sold poultry and pet supplies. This consisted of an inverted fruit jar screwed into a metal base that consisted of a narrow trough into which the water flowed when its level dropped sufficiently. I also scattered some chick feed into

the bran so that the chicks could start feeding as soon as they arrived.

In due course the chicks arrived. I was delighted with the fluffy yellow creatures. How amazing that at the age of 1 day they are self-sufficient. All they need is warmth and available food and water. All worked out well and the chicks grew quickly. I sold the six hens my father had bought and moved the brooder into the chicken house. When the chicks were covered with feathers, I let them out of the brooder and removed the heating bulb. Incidentally, I stretched an electric wire from the house to the chicken house.

In a few months the chicks had grown into pullets and I let them out into the fenced-in yard. One day I was surprised to see one of the pullets running around outside the fenced-in area. It had flown over the six-foot fence. To prevent this, I cut the flight feathers on their wings so that they were unable to fly.

Summer came and our drive to Maine. For this I made a small crate out of lathes and wire netting, put straw on the floor, scattered food in it, and hung a can for water on one side with a note: Please fill with water. I sent the crates by freight to Waldoboro, ME, a day before we left. It arrived 2 days after us and was brought to the farm by our grain-dealer neighbor, Edgar Winchenbach.

I arranged one of the chicken houses beyond the barn for the chickens with an outdoor, fenced-in yard. In the fall we sent it back in the same order.

In order to supply the hens with fresh greens in the winter, I bought a four-legged metal stand about 3-ft high. It consisted of three shallow metal trays about 2-ft in diameter arranged one above the other. These were filled with earth about 2-in deep, and planted with quick-growing plants. These would grow into a carpet of green in about 6 weeks. The three trays were planted 2 weeks apart and moved so that the newly planted one was at the bottom since it needed no bright light, and the one that had sprouted was at the top in sunlight. This stand was placed in the kitchen near a window that got sunshine part of the day. The chickens were fed greens at intervals of a few days as they became available.

When the hens started to lay eggs, it was necessary to take account of the fact that the natural cycle is to lay most eggs in the summer and fewest in the winter when hens cannot consume enough food in the short days. This can be changed by providing electric lights in the chicken house. This I did by stretching an electric wire from the kitchen to the chicken house with a switch and dimmer in the kitchen. In winter months I turned the lights on when it got dark and left them on till 6 o'clock. I dimmed the

lights before shutting them off to give the hens warning to fly up to their roost.

Fresh eggs were hard to get in stores in the winter and I was able to sell most of those laid by my hens for $1.00 per dozen. Two elderly ladies next door and the family across the street were very steady customers. In the spring and fall, the hens laid many more eggs than I could sell or we could use. This surplus I put in large crocks filled with water-glass. These our family used the following winter when the supply of fresh eggs was only enough for my customers.

As eggs get older, the air cell at the rounded end of an egg increases in size. In air an egg as it ages spoils; in water-glass, it stays good. The increased size of the air cell causes no trouble when frying or poaching eggs. However, when an egg with an enlarged air cell is put in boiling water, it explodes as the air in the cell expands. My father liked a boiled egg for breakfast! He found a simple solution. After washing off the water-glass, he took a pin and gently pushed it through the shell at the rounded end of the egg. This let the air out of the cell as it expanded and he ate it just as if it were a newly laid egg.

We continued shipping the crated chickens by freight to Maine and back for a number of years. Then my brother

Rolf, who was in college, suggested that he would have the sedan body on his car replaced by a truck body. This turned out to be not too expensive, so he had it done. We then put the crate of chickens in his truck and drove to Maine and back in the two cars.

My experience with poultry farming ended when I went to graduate school. Regretfully I sold my chickens.

Chapter VII

The Farm

As the middle of June 1919 approached, my father and we all looked forward to going to the farm in Maine. But there was a problem. My mother was expecting a baby in midsummer and obviously would have to stay in Rochester. Accordingly, my father asked his sister, our Aunt Sue, to stay with my mother all summer. This she gladly did. During the year my father had told his friend Professor Eiserhardt about the farm in Maine. Eiserhardt had never been in Maine and expressed great interest in seeing the farm. My father explained to him that we would be our own cooks and housekeepers since my mother would not be there. This sounded like a new venture to him and he said he would like to go with us. My father finally agreed. We five took the train for the long trip to Waldoboro. It was a hectic summer. My father divided us into two teams: he and I would be one, Eiserhardt and Rolf the other. We would be responsible for the cooking and housekeeping on alternate days. I was surprised to find that my father was really a good cook. He had helped my mother when we three were babies and again the year before. With my father's help, Rolf and Dr. Eiserhardt managed quite well. Fortunately, my

father had arranged with the farmer next door to plow a section of the hay field near the house and planted a garden in the spring. Beginning in the middle of July, the garden yielded potatoes, beans, peas, carrots, beets, and Swiss chard. The apple orchard behind the house included an early variety, the Red Astrachan. This tree provided many apples which made excellent applesauce.

We got our water from a well between the front corner of the house and the road. It had beautifully clear cold water that tasted very good. However, one day when we were pulling up our pail of water, a man passing by on the road stopped and said that the well had been condemned. My father immediately sent a sample to the testing laboratory in Augusta, and in due time we received the report stating that the bacterial content of the water made it unfit for human consumption. Of course, we stopped using the water and took turns walking to our neighbor's well with two empty pails and carrying them back to the farm. Since this had to be done every day, rain or shine, it was quite a chore. We did use the well water in cooking since it was boiled and safe to use.

My father immediately inquired about having another well dug. He was advised to have this done behind the house and well away from the road. The well was dug during the fall and the following spring so that when we

arrived the following summer, it was completed. It had a depth of about twenty-five feet and was twelve feet in diameter so that it contained an enormous amount of water. It was covered with a square of boards supported by 2×4's. In the center was a square hole with a sliding cover from which we could lower a pail to the water level about eight feet down and pull up a pail of water. Unfortunately, when we had the water tested, the report was again unfavorable. It was not safe to drink, so we had to continue to carry water from our neighbor's well. My father was very upset. The well had cost a large sum of money. What could be done? We had to have pure drinking water, but how could it be obtained? Our neighbor had a very good well that wasn't very deep and was quite close to his house and the road. Why was our property so different?

Actually, there was one additional possibility: an artesian well. My father quickly decided to have an artesian well bored, and regretted he had not made this choice in the first place. A few weeks later a tall rig moving on a heavy tractor moved into our backyard. It came within about eight feet of the back wall of the house and began by driving a pipe inside a larger pipe into the ground. It did this by dropping an enormous weight with a blunt edged bottom from about twenty-five feet. Af-

ter pounding for a few minutes, water was poured down and pumped out with whatever the pounding had loosened. This went on day after day from seven a.m. to six p.m. The first thirty feet went quickly, since it was through blue clay. Then came a 100-foot thickness of granite. This went very slowly and required rotating the edge of the weight a few degrees after each stroke. At this depth an aquifer had been reached and water poured into the hole from all sides. This had to be pumped out after every few strokes. Finally, the water entering was so voluminous that it was increasingly difficult to pump it out. They continued slowly for another thirty feet until the well was 160 feet deep and the water rose to within twenty feet of the top.

The well-borers then left and it was up to us to put a smaller diameter pipe into the well and provide it with a lift pump. In doing this we had to be careful not to drop the two-inch pipe as we attached one twenty-foot length to another and simultaneously lowered the combined lengths. To accomplish this we constructed a threaded wooden clamp that could be screwed tightly onto the pipe to hold it in place and loosened to let it slide slowly down. When its entire length was in the well, we would screw on a coupling. Next we raised another twenty-foot section of two-inch pipe into the vertical po-

sition and screwed it onto the coupling. We now had the problem of passing the coupling through the clamp. If we loosened the clamp enough to let the coupling pass slowly through, the entire pipe would drop to the bottom of the well as soon as the coupling had passed through the clamp. We obviously needed a second clamp attached to the pipe above the coupling. This we made and attached to the pipe. We then readily lowered four twenty-foot lengths or eighty feet of pipe so that it extended far into the water. Finally we screwed the pump to the top of the pipe. Before lowering it and the attached pipe to its final level, we built a concrete base which contained the four vertical bolts to hold the pump firmly to the ground. When the concrete had set and the bolts were rigidly in place, we lowered the pump onto the base and screwed the nuts on the protruding four screws. I have gone into considerable detail in describing this procedure since many years later when my niece owned the farm, she hired a plumber to connect the well to an electric pump in the cellar and remove the hand pump. In doing this he unscrewed the pump but then failed to properly clamp the pipe so it dropped to the bottom of the well.

With our artesian well just outside the back door, we pumped all the water we needed instead of carrying it in pails from our neighbor's well.

I entered the University of Rochester in the fall of 1923. I majored in physics and graduated in June 1927 with honors in physics and French and prizes in English and German. During those four years we went to the farm in the summer and our stay there presented interesting new challenges for me. In the second year, my physics professor, and former neighbor from Thayer Street, E. Lawrence, called my father and told him that he was selling his 1917 Studebaker seven-passenger Touring Car and buying a 1923 model; he thought it would be an ideal means for our family of six to travel to Maine. He said it would cost us $150. We discussed the problem in our family. My father said he wouldn't trust himself to learn to drive and take us all the way to Maine from Rochester, New York. I was very interested and volunteered to learn. Professor Lawrence went out with me in the car a number of times until I felt secure in my driving. For several months before our first trip to Maine in the car, I took the family out for drives in the country and learned to change tires. Professor Lawrence also showed me the engine and explained that spark plugs had to be changed at regular intervals and the points in the distributor cleaned. At longer intervals the valves would need to be ground.

My father decided that since we had no idea how long it would take or what we would experience on the long

Perc and Ronold with the 1917 Studebaker.

drive, it would be best for my mother with baby Don and Rolf to go by train as in the past while he and Perc and I could drive. He would call my mother when we arrived in Maine and they would then take the train. This worked out very well.

Our drive to Maine took almost four days. Being inexperienced, we looked at a road map and took what looked like the shortest way to Maine. It crossed New York State to Troy where it crossed the Hudson, continued through Brattleboro, Vermont, on a steep road that crossed the Green Mountains. It continued across New Hampshire passing through Manchester and Nashua and inland Maine to Portland. In Maine it continued to Brunswick, Bath, Damariscotta and on to Waldoboro.

On our first day we managed to cross New York State on mostly gravel, washboardy roads. We stopped overnight in a hotel in Troy, New York. From Troy we drove up the Taconic Trail into the mountains of Vermont. The roads were rough and narrow and in places very steep so that it was necessary to shift into the lowest gear. Across New Hampshire was a little different. We stopped overnight in a house that had a sign out "Rooms for the night." For meals we stopped at little restaurants in small towns. We finally reached Portland, Maine. In those days there were no route numbers and few road signs. Some routes were marked with blue- or green-banded telephone poles. The trip up the coast of Maine from Portland to Waldoboro was made even more difficult because of the long bays and inlets from the ocean. At Bath, the Kennebec River is very wide and its level rises and falls with the ocean tide. A special ferryboat is used to carry the locomotive and four cars across the river. With much shunting, two cars were pushed onto each side and the locomotive steamed onto the center. There was space for about six automobiles which drove on last, but left first on the far side of the river. If more than six cars wanted to cross, they had to wait nearly an hour for the next trip. After taking part in this maneuver and safely getting across the Kennebec, we drove on over the same type of rough gravel roads to

Wiscasset. Here there is a wide shallow inlet from the sea. The train track goes quite far inland from this, but automobiles cross on a long trestle that floats on the water. It is bumpy and the several sections rise and fall as the auto crosses onto it and leaves it. Since it is one way, it is necessary to wait for a number to travel successively in each direction.

From Wiscasset the road continued across rolling country to Damariscotta. This was a fishing village with a nice restaurant on one of the fish piers, where we had lunch. From Damariscotta to Waldoboro the country became increasingly hilly. As we neared Waldoboro, we climbed a really steep hill, crossed a ridge and descended another even steeper hill to cross a short bridge over a little tidal bay and then climbed another hill but only halfway up to Waldoboro. Here the main coastal highway crossed the Friendship road that extended from the railway stop across the highway to Friendship, the seacoast town ten miles distant. In the center of the crossing stood a tall policeman under a large parasol-umbrella that could be rotated to display "Go" or "Stop" in any of the four directions. We turned right to drive five miles out to South Waldoboro and the location of the farm. This road was really rough. At some points a lot of brush had been combined with gravel to prevent a washout in a heavy

rain. Somewhat more than halfway there, the road made a very sharp left turn to begin the steepest ascent we had yet encountered. It was called Thomas' Hill and was used locally to test the climbing ability of automobiles. We crawled up very slowly in the lowest gear. From here to the farm the road had many steep ups and downs but these were short. Finally we arrived at two churches, the Baptist Church on the left, the Methodist Church on the right. Just beyond them came the white house of the farm.

We drove into the driveway to the farm after a very long drive from Rochester, New York. We unloaded our suitcases and the groceries and supplies we had bought at the grocery store in Waldoboro and started a fire in the kitchen stove. My father went to the telephone, which was on a 14-party line. Fortunately no one was on the line and he asked for long-distance. When the operator replied, he gave our Rochester number and soon got my mother. He told her of our safe arrival and long trip and told her, Rolf and baby Donald to leave by train the next day. He said we would meet them at the Waldoboro stop when their train arrived. They would spend the first night in a Sleeping Car from Rochester to Boston traveling on the Main Line, New York Central from Rochester to Albany and on the Boston and Albany to Boston. In

Boston they would take a taxi from South Station to North Station and travel on the Boston and Maine to Portland, Maine, where their car would be hitched onto a Maine Central train that continued up the coast to Rockland. They would get out in the afternoon in Waldoboro. This all worked out well, we met their train and drove them to the farm. After a pleasant summer we traveled to Rochester the way we had come: Rolf, my mother and baby Donald by train, and my father, Perc and I by car. Our summer trips to Maine in succeeding years were made with the whole family in the car. We camped out most nights in state and national parks. We pitched two lean-to type tents on each side of the seven-passenger open car. The right front seat could be reversed and the long seat cushion combined with it to make a full-length, albeit narrow bed. I constructed a canvas crib to fit behind the driver's seat. In this way my mother and baby Donald slept in the car and we four, two on each side, in folding canvas cots.

The next important event related to our summers at the farm was when electric power was put through from Waldoboro to Friendship. My father immediately subscribed and the Central Maine Power Company ran wires to the house and installed a meter on the outside wall and a fuse box and main switch in the cellar. My fa-

ther inquired about an electrician to wire the house, but none would be available for a year or two. I was halfway through college majoring in physics and volunteered to wire the house. I bought a book that described the regulations for electric wiring in city houses and decided to follow these even though they were much more restrictive than wiring in country houses in Maine. In particular, it was required to have all wires in metal conduits or in armored cables. Furthermore, it was required that the principal wires running from the fuse box to the most distant points in the house be uncut and contain no soldered connections. Wires would then emanate from these at appropriate points. These would be soldered to the main wires. The junctions were in round or square metal boxes.

My first step was to make a scale drawing of the complete floor plan of the house, the attached carriage house, and the barn. I carefully laid out the locations of the metal conduits and the associated junction boxes so that uncut wires could extend in them from the fuse box to the upstairs; from the fuse box to the kitchen, carriage house and barn; from the fuse box under the living room, the front hall and the large room we used as a downstairs bedroom. I next determined the positions of junction boxes along the conduits from which would emanate the

armored cables to the actual outlets. I decided to have only wall outlets downstairs, ceiling outlets upstairs since there was a crawl space over the upstairs bedrooms. Then the types and number of outlets had to be determined together with wall switches and lamps. Finally, I ordered all needed parts from Sears & Roebuck, which stocked all wiring needs. When it all arrived, I started work and found it very complicated. Downstairs wall outlets in the main house had to be connected by armored cable to the uncut wires in the conduits in the cellar. This required soldering at the boxes and getting the end of the cable up through the wall to the box in the wall in the several rooms. However, the main house rested on sills that were 8-in × 8-in so that to get the cable to a box in the wall it was necessary to bore a hole diagonally up through the 8-in × 8-in and the 2-in × 3-in nailed to it into the empty space in the wall where the box was located. This required very precise measurements—both in the cellar and the room above it. When the end of the cable was pushed up through the hole into the space in the wall above it—hopefully close to the rectangular opening for the wall box—it was usually several inches to one side or the other. How to reach into the rectangular opening in the wall and pull out the cable so that its ends could be screwed to the wall fixture was a problem.

My hand was too big to get into it and feel around to locate the end of the cable. Fortunately, there was a solution close at hand. My 5-year-old brother Don was an avid observer as I worked and followed me like a shadow. When I explained my dilemma to him, he promptly put his little hand into the hole and reached around to right and left, located the end of the cable, and pulled it up and out of the hole. Obviously the complete wiring took a long time. In fact, it took two summers before there were electric lights throughout the house, the shed, the carriage house, and the barn. The complete enterprise was highly educational for me. It made electricity very real, although in a very simple form. In a small way it was the beginning of my long career in electromagnetic theory and its applications.

With electric lights installed everywhere at the farm, the next challenge was an electric pump, running water, a flush toilet, and a septic tank. I bought a book on plumbing, ordered the necessary parts, and carried out the work with some help in digging the hole for the septic tank, the drainage bed, and the long connecting pipe from the one toilet to the tank. This had to go under the floor of the barn. The pump was connected to the large well behind the house. We did not drink this water but used it for all other purposes since it was safe when boiled.

Drinking water we continued to pump by hand as needed from the artesian well behind the house.

Chapter VIII

Germany – 2

After graduating from college in June 1927, I decided to work for a Master's Degree. In my earlier work in physics I had become interested in resonance phenomena. I had read the interesting paper by the German physicist Lecher on standing waves on parallel wires—generally called "Lecher wires" in the United States. With the help of a very competent mechanic named Fred Baumgarten and Associate Professor of Physics Fairbank, I constructed two long parallel wires—actually thin telescoping brass tubes. These were supported by thin wooden cross-pieces which maintained the constant distance between the brass tubes. I constructed a high-frequency oscillator that generated electromagnetic oscillations at a frequency of the order of 1 GHz or a wavelength of $\lambda \approx 30$ cm. This was designed so that it could be coupled to the two parallel wires at any desired point and induce equal and opposite voltages in them. I also constructed a receiver that consisted of a crystal detector and a small coil that could be coupled to the two-conductor line at any desired point. I then made an exhaustive study of the two-conductor line when tuned to resonance with either open ends or ends short-circuited by a transverse con-

ducting bridge laid across the two tubes. The detector was moved continuously along the line with the location of the generator fixed or vice versa. This was done with both open ends and short-circuited ends. The complete study was published in the *Review of Scientific Instruments*, a journal that ceased to exist long ago.

In that academic year, 1927–28, I entered the national competition for an American-German Exchange Fellowship to do graduate work at the University of Munich and the Technical University, both in Munich, Germany. I was successful in winning this. It provided for travel expenses and room and board at the Studentenhaus in Munich. I was especially pleased because my father would have a sabbatical leave for the second term that year and had decided to go to Munich. I did not go to the farm that summer but took the train to New York City late in June. I was met at the station by my uncle, Wilhelm Burkhardt, and taken to the wharf where I embarked on the *American Farmer*. This was a freighter that took a small number of passengers with cabins on the upper deck. I had packed all necessary belongings in a sturdy steamer trunk which I had checked through to the Munich railway station. I carried an extra-large suitcase since it would be some time before I got to Munich and possibly even longer for the trunk to get there.

After a tugboat pulled the *American Farmer* out of New York Harbor and it had passed the Statue of Liberty, it headed for the open sea. Since the freighter traveled much more slowly than passenger boats, it would take ten days to reach port in the Netherlands. For me the trip combined exhilaration with apprehension. Since I had lived at home throughout my years at college and had spent summers at the farm, I had been with my parents continuously. This was my first adventure alone. On the long voyage I spent most of the daylight hours standing at the bow watching the waves go by and the dolphins that escorted the ship. I was joined there by an attractive young lady who quite took my fancy. She was also going to Europe for the first time but was going to France, not Germany. We conversed about our backgrounds, our families, and our plans. It made a tedious voyage a pleasure. On landing in Holland we said goodbye quite regretfully since we would never see each other again.

Since the train trip to Munich was quite long and passed through attractive country, I decided to interrupt it and stay overnight at inexpensive hospices on the way. I had purchased Baedecker's Reiseführer, a very useful guidebook for travelers, and located two suitable places along the way. I left the train at these stops and spent half a day and a night at each. I finally arrived in Mu-

nich and took a cab to the Studentenhaus on the Luisen Strasse. Actually the exchange students were not given rooms in the large Studentenhaus where the German students at the University of Munich lived, but were assigned rooms in a nearby building where Director Beck and the business offices were located. On the second floor of this building were rooms for two American, two British, two French, and two German students. On the same floor was a large washroom with a dozen washbasins with running hot and cold water. There was one small bathroom with a tub. This was kept locked but could be used for a fee of one mark, which included a cake of soap and a large towel. I lived at the end of a long corridor with a window out into the backyard. When I looked at the bed, I found that it had a large feather puff instead of a blanket. Upon expressing my desire to have blankets instead of the featherbed, these were promptly supplied. The exchange students ate a simple breakfast together in a small room on their floor. The other two meals were served in the large Mensa where all German students ate their meals at a nominal fee.

The second American Exchange Student and I had little in common. He was a chemist from the Middle West, spoke little German and concentrated on his chemistry courses. My special friends among the exchange students

turned out to be a classical scholar named Parke from England and one of the two German students. Parke was not athletically inclined but enjoyed going to concerts, operas, and plays which were continuously available in a great cultural center like Munich. The German student, on the other hand, joined me in long bicycle rides to various parts of the city, especially along the banks of the Isar River which flows through the center of the city. Munich has a large network of bicycle paths which provide a safe and attractive way to see the city. Another special adventure was to take our bicycles on the train to the Bavarian Alps. A bicycle could be taken for a very small sum if it was lifted up to an attendant in the baggage car and retrieved at the destination. This required some quick work since the train did not stop long. The train climbed steadily to a very considerable elevation to cross the mountains southward. At the highest point we would get our bicycles and virtually coast most of the way back to Munich. It was a delightful day excursion which we both enjoyed.

Entertainment was, of course, restricted to weekends and evenings. During the week we attended lectures and studied in our rooms. I attended lectures by Professor Arnold Sommerfeld at the University of Munich. In three years (six terms) he gave a cycle of lectures on six

aspects of physics. These included theoretical physics, electrodynamics, mechanics, fluid mechanics, statistical mechanics, and atomic physics. Unfortunately, the term on electrodynamics was not given in the fall term and, during the spring term, Professor Sommerfeld was to be a visiting professor at Cornell University in the United States—where I would be the next academic year. In the fall term while I was in Munich he lectured on theoretical physics. As one of the most famous scholars in the world—he was the founder of atomic theory—his lectures attracted students from all over Germany as well as from other countries. They were given in the largest lecture hall in the university which was shaped like an amphitheater with rows of seats and desks in semicircles descending to a large desk in front of a blackboard. Sommerfeld was a very skilled lecturer. He spoke slowly, clearly, and with a loud voice that could be heard and understood everywhere in the lecture room. I took careful notes and studied these later in my room. At the end of each week an assistant handed out sheets of problems relating to the lectures. These were to be solved and handed in each week. At the end of the term a comprehensive final examination was given. I also attended the demonstration lectures of Professor Zenneck, but did not attend the associated lectures on experimental physics. As a matter of

interest I listened to lectures on advanced calculus. After learning physics and mathematics in English, it was interesting to hear the same subjects presented in German. Since Professor Sommerfeld was in the United States in the spring term and the available courses at the university were not interesting for me, I went to the Technical University instead. Here a Dr. Schumann, a young Dozent (docent) who had not yet attained the rank of professor, was giving a course on applied electrodynamics. I found this very interesting since it gave me my first introduction to Maxwell's equations. Dr. Schumann was later to discover the earth-ionosphere wave-guide.

In addition to attending lectures, I worked very hard to write a paper on my experimental work on standing waves. I wrote a fairly long paper in German and submitted it to the *Annalen der Physik*. It was accepted and published even though the mathematical analysis of the systematic experimental work was superficial and incomplete. All in all, my year in Germany was probably the most important in my education. It ranged from advanced physics and mathematics to operas and concerts. Beyond that, it gave me a broad insight into European culture and perspectives—very different from those in the United States.

My parents arrived in Munich with nine-year-old Don-

ald near the end of January. After staying in a hotel for a few days, they found an attractive boarding house quite near my room on the Luisen Strasse. It included all meals and was within walking distance of the university library where my father expected to do most of his work and also within walking distance of the Luisen Elementary School where Don would have to go. German law was very strict and required every child of school age to be in school. Needless to say, Don was the center of attraction among the German children. He entertained them with many tall tales about how remarkable everything in the United States was. An example is his assertion that the ship on which he crossed the Atlantic was as long as the Luisen Strasse. My parents invited me to join them at Sunday evening dinners. I enjoyed this very much. My father was much amused by the fact that many of the other boarders regularly drank a glass of tonic which they poured out of bottles similar to wine bottles. They claimed it was good for their health. One night my father appeared with a large bottle of wine from which he had removed the label. Very ostentatiously he poured my mother and himself a glass and began to sip it at the same time the others drank their tonic. He told them he had decided to drink a glass of tonic too. He then asked them if they would like to try his tonic. Many of them did and said it

The King family in Germany: (left to right) Egmont Seyerlen, Edith Seyerlen King, Donald King, J. Percival King, and Ronold King.

Chess game between Ronold and Donald King with their parents looking on.

Dr. James Percival King (on the right) with two University friends in Germany.

tasted better than theirs.

In the middle of summer we all returned together to Rochester in plenty of time before the opening of college in September. I presented a short lecture to a few faculty members and a small number of graduate students working for a Master's Degree. The faculty approved granting me the Master's Degree on the basis of my year at Rochester and a year abroad. My paper was accepted in lieu of a thesis.

While in Germany I had applied for a scholarship at Cornell University which I won. Accordingly, I went to Ithaca in time for the opening of the fall term. I rented a small room on the hill within easy walking distance of the campus. I passed all my courses but no one in the Physics Department showed any interest in my work on standing waves. I decided not to continue at Cornell but to join my brothers at the University of Wisconsin in Madison. Rolf had gone there after graduating from Rochester with a major in German. A Professor Hohlfeld at Wisconsin was internationally known as a German scholar and Rolf hoped to earn the Ph.D. under his direction. Perc had spent a year at Massachusetts Institute of Technology in mechanical engineering but didn't like the atmosphere or find the students friendly. He had decided to study physics, not engineering, at Wisconsin. The Wisconsin

The three King brothers: (left to right) Rolf, Ronold, and Percival.

catalog suggested that I should work under Professor Edward Bennett, Head of the Electrical Engineering Department. I had written to him, been accepted and awarded a State Scholarship.

While in Germany I had written two papers and while at Cornell two more. These were published before I completed my Ph.D. They are:

"Ueber die Form der Resonanzkurven bei stehenden elektrischen Drahtwellen," *Annalen der Physik*, 5. Folge, Bd. 3, S. 934–936 (Oct. 1929).

"Eine zusammenfassende Untersuchung ueber stehende elektrische Drahtwellen," *Annalen der Physik*, 5. Folge, Bd. 7, S. 805–832 (1930).

"Standing Waves and Resonance Curves," *Rev. Sci. Instr.* **1**, 164–180 (Mar. 1930).

"A Screen-Grid Voltmeter and Its Application as a Resonance Indicator," *Proc. I.R.E.* **18**, 1388 (Aug. 1930).

Chapter IX

Wisconsin

Professor Edward Bennett was a short, stocky, electrical engineer. He had written a book on electrical engineering, which he used as a textbook in his courses in electrical engineering. These dealt primarily with power engineering, electric motors and generators. He knew little about electromagnetic theory and radio engineering. When I explained to him my desire to do experimental research on standing waves on wires and showed him my two publications, he was delighted. He himself did no research and had virtually no graduate students. He assigned to me an office-research room on the top floor of the electrical laboratory above the large laboratory in which the electric motors and generators were anchored for student experiments in power engineering. The only other graduate student working under Professor Bennett was a young man about my age, named George Brown. He was corpulent and jovial and we became close friends.

As a second year graduate student I was required to take one more year of courses and also proceed with my Ph.D. thesis which was to be centered about my published researches on standing waves. Fortunately, a very distinguished professor of mathematics named Warren Weaver

had a very strong interest in the theory of electricity and offered a year course with that title. He had just published a book entitled *The Theory of Electricity* by Max Mason and Warren Weaver. Max Mason was a professor at another university who had collaborated with Warren Weaver in writing the book. I was fascinated with the book and the course which followed it closely. It began with the very basics in electrostatics—the attraction and repulsion of electric charges—and continued through magnetostatics, direct currents, alternating currents, and finally general electromagnetic fields as defined by Maxwell's equations. I also took a course in theoretical physics under a young associate professor named J. H. Van Vleck. He had completed the manuscript of a very significant book entitled *Electric and Magnetic Susceptibilities*, and near the end of the year started receiving the proof sheets. He asked me to read and correct these as they arrived.

At the end of the year I was to take the qualifying examination which would give official approval to my starting work on a Ph.D. thesis. Professor Bennett had told me six months before the exam not to prepare specifically for the oral examination but to concentrate on my research. He would begin the examination by asking me to spend half an hour explaining and discussing my research. He would then ask the examining committee for any questions about my research. I took him at his word and did not review the course work I had taken with the other professors who would be on my examining committee. It all worked out fine until Professor Bennett asked the others on the committee for questions. However, they did not question me about my research, but about topics in the courses I had taken with them. Since I had not reviewed these and had forgotten the details of long derivations I had once known by heart, I didn't do very well. The committee, which included Professor Van Vleck and Weaver, passed me with some reluctance. After the exam I excused myself to Professor Bennett and said I should have spent time on reviewing earlier work. He merely smiled and said, "you have to be prepared for anything."

Since I was submitting four published papers as my thesis, one of them in German, Professor Bennett said it would be necessary to write them out in English in the usual typewritten form, bound in red covers. When I inquired at the library, where the theses were all deposited, I was informed that published papers did not have to be rewritten and that any major language was acceptable. So I took two reprints of each of the published papers to the library. A week later, Ph.D.'s were formally awarded

by the Chancellor. I had inherited my father's cap and gown with its blue stripes indicating the Ph.D. The award ceremony consisted of a hand-shake with the Chancellor, the handing over of a diploma, and the draping of a red-lined Wisconsin hood around my neck to hang down on my back. In June 1932, at the age of 27, I had completed the long academic journey to the top.

The severe depression which started in 1929 was still far from over in 1932. All attempts I made to find some kind of a position teaching or in industry were to no avail. The University recognized this and provided limited funds in the form of teaching and research assistantships, free meals at the cafeteria of the Student Union, and a free room in one of the student dormitories. I was appointed Teaching Assistant for the year 1932–33 and Research Assistant for 1933–34. I was paid $500 each year and lived in a very nice room in one of the newer dormitories. As Teaching Assistant I was put in charge of one of the power-engineering laboratories. Actually, I spent most of my time on research, working on the development of new electric generators for ultra-high frequencies. At the same time, George Brown was working on determining the electromagnetic field of simple dipole antennas with reflectors. After a time we decided to pool our results. I supplied a generator to drive one of George's

dipole antennas. I also constructed and provided a crystal detector which, with a sensitive micro-ammeter borrowed from the student laboratory, was connected as load for a second one of George's antennas. We then set up the transmitting system at a central, secluded spot on the University Campus and traveled around in the truck with the receiving system mounted on the back of the truck. On a map we had located suitable points to take measurements both on radial lines from the transmitter and circles around it. With these data we were able to construct field patterns of the antennas.

Our results were published in the paper: R. King and G. H. Brown, "High-Frequency Models in Antenna Investigations," *Proc. I.R.E.* **22**, 457–480 (Apr. 1934). I also prepared three papers, viz., "Wavelength Characteristics of Coupled Circuits Having Distributed Constants," *Proc. I.R.E.* **20**, 1368–1400 (Aug. 1932); "Amplitude Characteristics of Coupled Circuits Having Distributed Constants," *Proc. I.R.E.* **21**, 1142–1181 (Aug. 1933); and "A Screen-Grid Voltmeter Without External Leak," *Proc. I.R.E.* **22**, 771–780 (June 1934).

Another enterprise that George suggested was related to the 1923 paper published in England by H. H. Beverage, C. W. Rice, and E. W. Kellog with the title "The Wave Antenna." This antenna consists of a long wire

close to the surface of the earth. It is driven at one end with the generator in series with a grounded resistance. It is terminated at the far end in a resistance grounded to the earth. With a proper choice of resistance, a traveling wave is excited along the wire and in the earth that continues beyond the end of the antenna as an outward-traveling electromagnetic wave in the earth and in the air close to the earth. A receiving antenna is obtained when the generator is replaced by a suitable load.

As a resident of Wisconsin with an interest in antennas, George knew that the state of Wisconsin maintained a tall radio transmitting antenna to broadcast state programs to the surrounding countryside and a similar antenna about 100 miles north of Madison at Stevens Point. The Stevens Point antenna received its programs from Madison by telephone wire which the State rented continuously from the telephone company at considerable expense. It occurred to George that a pair of Beverage antennas could provide a substitute for the telephone connection if appropriate locations could be found. It turned out that the State owned considerable property near each of the antennas and George obtained permission to construct a Beverage antenna on each of these. We then drove short wooden stakes into the ground at regular intervals in a direction from one tower to the other.

This we accomplished with the help of a compass. When the stakes were in, we stretched a copper wire from one to another at the right height—about two feet above the ground. We determined the required length and height using formulas from the paper and the frequency used by the transmitting tower. The state engineer in charge of the broadcasts assisted us. When all was completed, the switch from telephone wire to the Beverage antennas was made. The test was successful and the money for the telephone connection was saved. George and I were given a little write-up in the newspaper for this useful application of antenna theory.

After spending the academic years 1932–33 and 1933–34 carrying on research in Madison, the job market opened slightly and George accepted a position with the telephone company in Chicago. There were two academic positions open—one in Oklahoma, the other at Lafayette College in Easton, Pennsylvania. I applied for both and was successful at Lafayette in that I was invited to come to Easton for an interview with Professor Gordon, Head of the Physics Department. I was very hopeful and especially pleased since Easton, Pennsylvania, was not very far from Rochester, New York.

Chapter X

LaFayette College

Easton, Pennsylvania is a small college town in the Pocono Mountains. My father drove me to Easton in the late summer of 1934. I had scheduled an appointment with Professor Gordon, the Head of the Physics Department. When we drove up to the Gordon house and I got out of the car, Professor Gordon came out. My father had intended to drive on and leave me alone with Professor Gordon, but when Professor Gordon saw him in the car and found out that he was my father, he immediately invited us both to lunch at the Faculty Club. Professor Gordon paid little attention to me, but enjoyed an animated conversation with my father. They talked about their backgrounds, education, etc. My application was quickly approved and I received an official appointment as Instructor in Physics. My salary was $1,000 per year with a free room in a student dormitory where I would act as House Master. My duties were to take charge of the laboratory and two quiz sections associated with the large introductory lecture course, and to teach a graduate course if there were any students working for the Master's Degree. Professor Gordon emphasized that I was given a relatively light teaching load so that I would have time

to carry out research projects.

I had a long talk with the Dean. He was very frank and explained that LaFayette College was very poor. He said the small endowment provided enough income to maintain the grounds and buildings and support the officers of the administration. Faculty salaries were supported only by student tuition, so that the more students were registered, the more funds there were for salaries. He emphasized in particular that virtually no students should be dismissed because of failing grades. Even the weakest student should be given a low passing grade. All this was a complete surprise for me since at the University of Rochester and the University of Wisconsin, grading had been strict and many students were dismissed each year for failing grades.

I enjoyed my three years at LaFayette College. By and large, the students were a mediocre lot, but there were a few very brilliant ones that I was able to interest in small research projects. Since departments were small, social activities included most of the faculty. The Faculty Club sponsored frequent dinners and dances at which one became acquainted with members of different departments. In particular, at such dinners, faculty members were invited to present papers describing their work in a non-technical way, or on any subject they wished.

I presented several papers, one on "Physics for the Non Physicist," another on the philosophical subject entitled "Culture, a Scientist's Ideal." This was later published in the *Scientific Monthly*.

I carried out very extensive research projects—primarily theoretical since LaFayette College had no research funds. These led to nine publications which were published in leading journals. They included two non-technical papers, "Physics, Metaphysics and Common Sense," *Scientific Monthly* **42**, 30–81 (Apr. 1936) and "The Elementary Foundation of Mathematical Physics," *American Math. Monthly* **44**, 14–22 (Jan. 1937). These won me a Guggenheim Fellowship for study in Europe during the academic year 1937–38.

In the spring of 1936, I experienced one of the biggest surprises of my life: I received a call from Professor E. L. Chaffee of Harvard University stating that he would like to come to Easton to discuss with me the possibility of my joining the Harvard Faculty. He came to Easton by train and I took him to the Faculty Club where we had lunch and then sat in the library for several hours where he explained the situation at Harvard to me. He said that Professor G. W. Pierce, a world-renowned scholar and multi-millionaire from his patents on the crystal-controlled oscillator, was retiring. They needed someone

to take his place teaching the graduate course on electromagnetic theory that he had developed in the Department of Physics. He also explained that Harvard had a Graduate School of Engineering which taught courses and supported graduate students in such subjects as Mechanical Engineering, Electric Power Engineering, Fluid Mechanics, Soil Mechanics, and Sanitary Engineering. He, personally, headed a group in Communication Engineering. He said that my proposed appointment would be to Assistant Professor of Physics and Communication Engineering. He added that both the Head of the Physics Department and the Dean of the Graduate School of Engineering had approved appointing me, but that approval by the Faculty was also required. He invited me to come to Cambridge, meet the Faculty, and present a talk at the Physics Colloquium on my researches. It would be at Harvard's expense. On the appointed day, I took the train to Boston and the subway to Cambridge where I left my suitcase at a hotel near the university and walked over to Jefferson Hall shortly before the colloquium time of four o'clock. I presented myself at Professor Chaffee's office. Since there was still some time before the colloquium started, Professor Chaffee said he would show me around. First, he introduced me to Professor Mimno, Acting Dean of the Graduate School of Engineering, who

carried on ionospheric research using huge antennas to send electromagnetic waves skyward to be reflected from the ionosphere. Next, he took me downstairs into a very well-furnished, large room in which were a desk, davenport, reclining chairs, and a coffee table. In it sat an old gentleman, Professor G. W. Pierce. He was not particularly friendly. I thought it would be polite to ask him about his current research interests—his large research room was right next door. He became suddenly abrupt and said, "Young man, if I explained the problem on which I am working and showed you my apparatus, how do I know that you won't steal the idea and write it up yourself?" I was nonplussed, but said I most certainly would do no such thing. The colloquium went well and led to many questions. "Standing Waves on Wires" was not a subject any of the physicists at Harvard had even thought about.

After returning to LaFayette College, I visited the Head of the Economics Department. I had become quite well acquainted with him at the meetings of the Faculty Club. He had just recently come to LaFayette from Harvard. I told him about the offer from Harvard and asked him what he thought of the advisability of accepting it or staying at Lafayette. He then carefully explained the differences. Notably, he said that at Harvard there was

a continual atmosphere of confrontation. Each professor had his own research group and no interest whatever in anyone outside it. He added that he could not envision spending the rest of his life in such an atmosphere of unfriendliness, that he much preferred the feeling of fellowship and mutual cooperation which characterized LaFayette College. However, I was young and had experienced so many diverse activities in Germany, Ithaca, and Madison that I did not hesitate long before accepting the Harvard offer which came in an official form soon after my visit to Harvard. Professor Mimno of the Graduate School of Engineering and the Head Professor of the Physics Department wrote very nice letters welcoming me to Harvard. My appointment would take effect in September 1938 upon my return from Germany and the Guggenheim Fellowship.

It may be of interest to have me relate an incident relating to the type of students at LaFayette College. My room was on the second floor of McKeen Hall in the center of the building. Actually I had two rooms, a small bedroom behind a large living room with windows overlooking the main part of the campus. On the same floor was a large square washroom. Along one wall were four shower cubicles, along the second wall were four wash basins, along the third wall were four toilet cubicles, and along

the fourth wall were four windows. This facility was used by all of the students on the second floor and necessarily by me. When I returned to McKeen Hall one day after a day at the office-research room, water was streaming down the stairs. I hurried up to the second floor which I found under a sheet of water. Trying to avoid the deepest water, I ran to the wash room and found that the drains of the four showers had been covered with a thick layer of newspapers and the hot and cold faucets opened wide. I got pretty well soaked before I succeeded in shutting off the water and opening the drains. There was no way of telling who was guilty, but the prank caused considerable damage. Fortunately, I had come by in the afternoon and not in the evening, as was more usual.

Chapter XI

The Cottage

During the entire period from graduate school to going to Harvard I had spent my summers at the farm. My brothers Rolf and Perc had done much the same. Don had grown up and entered Harvard as an undergraduate after doing brilliant work in high school in Rochester.

During the summers that I was at Cornell and Wisconsin, Rolf suggested that we should find a place close to the water so that it would not be necessary to walk three-quarters of a mile through the hay field and woods to go swimming in a place where this was possible only near high tide. He suggested that we drive over to the Penobscot Bay area and look for a place with an ocean-front. My parents were not particularly interested, but went along with us on several expeditions that took us through Thomaston, Rockland, Rockport, and Camden. In Camden we went to the Allen Real Estate Agency and inquired. Mr. Allen senior was an elderly man, about to retire. His son had bought a summer home on the shore of beautiful Lake Megunticook nestled in the Camden Hills. Mr. Allen owned two cottages overlooking Penobscot Bay in Rockport. He offered the one he had used for many years as his personal summer place. He offered to sell

The cottage porch: Sarah King, Perc, Donald, Edith King, and J. Percival King.

it to us for $3,000. This was a large sum in those days, but my mother decided to buy it with a mortgage that would be paid off in ten years. The property Mr. Allen sold us consisted of 5.6 acres of steep woodland that had 565 feet of shore frontage. The road to it also led to other cottages and we would get a right-of-way to the cottage. This was in 1930.

With this settled, the farm was put up for sale and, since Mr. Allen had sold us the cottage fully furnished, we did not have to move much from the farm. The cottage consisted of a central living room surrounded by an open

porch. There was a large kitchen in a separate building. Upstairs were two rooms with open ceilings below the roof. The front room had a door that opened onto a narrow porch half-covered by a sloping roof in the style of Swiss houses. The cottage was built on a steep slope of solid rock, the back porch rested on the rock, and the front porch rested on a long sill supported by long vertical posts and covered with lattice. There were electric lights and running water in the kitchen from a spring up on the hill. There was no bathroom, just an outhouse behind the kitchen.

We spent one disappointing summer at the cottage. My parents slept upstairs with Don, we three slept on soldiers' cots on the porch on one side. We were quite close to the ocean, but it turned out that the little pebble-covered bay to which we could descend was filled with water only near high tide. Moreover, the water was so cold that we could swim in it only a short time. We also found out that there was sun on the little beach only in the morning, so that swimming was acceptable only when high tide came in the morning. By the end of the summer we all agreed that the farm was better for swimming on all counts. It was promptly taken off the market. My parents decided to keep the cottage. For adults not interested in swimming, it was a very beautiful spot with

a magnificent view of Penobscot Bay and the Indian Island Lighthouse. The next summer my father decided to live at the cottage for part of the summer and do his preparatory studying there. While he was there, he had a solid foundation put under the cottage which provided a kind of cellar with board floor extending back about fifteen feet. The lattice on the cottage was replaced by boards down to the level of this floor so that a completely enclosed space was provided with a door on one side. We continued this arrangement for several summers with one of the three of us staying with our father. After this period my parents decided to get some income from the cottage and to advertise it in the Rochester paper. It became quite popular with school teachers and there was never a problem of renting it. One summer the tenants complained the spring did not supply enough water for the two cottages. Mr. Allen promptly had both cottages connected to town water by means of a surface pipe. Obviously, this was useful only in summer months.

In the summer of 1935 we received a call from the two teachers renting the cottage that there was a large hornets' nest under the eaves of the upper porch where they liked to sit in the sun and read. I promptly drove over from the farm with a long hose which I connected to the kitchen faucet, and brought it up to the upper

porch. The town water had tremendous pressure, so that by directing the nozzle to send a powerful stream of water at the hornets' nest, it was torn to pieces with thousands of hornets flying around but unable to reach me. The teachers were very happy not to have to contend with the hornets. That summer Professor W. D. Merrell, Professor of Biology, had applied for our cottage, but had inquired too late—the teachers had already rented it. He was able to rent the cottage next to ours from the Allen Agency. As I was leaving the cottage, I happened to look over to the cottage next door and saw a young girl trying to split wood. She made no progress. I walked across the piece of woods between the cottages and offered to help. She was a very pretty girl and happily handed me the hatchet. I split a pile of wood for her and asked her what her name was. She said, "Justine Merrell." She had graduated from the University of Rochester a year after me, majoring in biology. She introduced me to her parents and her older sister, Margaret. On the spur of the moment I asked Justine if she would like to go to the Saturday night dance at the Oakland Park Dance Hall on the shore in neighboring Rockland. I drove over the next Saturday and we had a very good time. We repeated this two or three Saturdays that summer.

The next summer I was surprised to learn that the

Merrells had rented a house in Friendship just five miles from the farm. They inquired if they could go swimming on our shore, and Professor Merrell said he would like to study the vegetation on the sixty acres of woodland on the farm. It became a regular event for the Merrells to come to the farm and walk down to the shore with us for a swim. On the long walks down to the shore (about three-quarters of a mile) and back, Justine and I usually walked together. I asked her, would she like to go to some of the Saturday night dances in Oakland Park in Rockland. She was delighted and on several Saturdays I picked her up in Friendship and we drove the quite long distance to Rockland to the dances. On the way back she was tired and often went to sleep, resting her head on my shoulder.

When the summer was over, Justine went to Middletown, New York, where she taught elementary school, and I went back to LaFayette College. We corresponded and saw each other in Rochester only during vacations. In the winter of 1937 we became engaged and we were married in June 1937. After a short honeymoon at the cottage, we sailed for Europe on my first Guggenheim Fellowship. We landed in Rotterdam and immediately took the night boat to Stavanger in Norway. We had been invited to make a short visit to a Norwegian named

Sailing off the farm shore: Ronold King at the helm, Justine King near the mast.

Andreas Byrne who had been instructor in German in my father's department. He had married a very wealthy American girl and they had moved to Norway. Byrne met us at the boat landing at five o'clock in the morning and drove us to his home where we went to bed to sleep for another three hours. We spent several days with the Byrnes who showed us around the interesting fjords. Next we boarded the coastal steamer to the city of Bergen where we stopped at a hotel for one night. We marveled at the unbelievably steep streets. From Bergen we took the train that traveled along the edge of the deep fjord and then over the mountains to Stockholm, Sweden. From Stockholm we took the train directly to Berlin where we planned to spend the winter. We found a pleasant apartment on the second floor of a large house. This was owned and operated by a friendly little lady, Frau Barz, who was much interested to have an American couple as her boarders.

Our apartment was very pleasant. It consisted of a bedroom and a living room. The latter had wide windows overlooking a main avenue. Since our apartment was on the second floor, we had a nice view to the right and left. In selecting the location of our apartment, I had studied a map of the city and also inquired which were good residential sections. As a consequence, our apartment was

quite close to a large park with footpaths winding along lakes in wooded areas. We were also not very far from the university and its library. My plan was to stay in Berlin through fall and winter and then go to Munich for spring and summer. I hoped to make real progress in preparing my lectures for Harvard. These were to be based on the manuscript of my first book on electromagnetic theory, which I expected to write during those six months in Berlin.

Since I would be busy writing and Justine would have no housekeeping to do, I persuaded her to devote her free time to learning German. I had learned that the university offered a course to learn German expressly for foreigners. It was taught by a remarkably skillful teacher with the name Hämmerling. In his class he welcomed those who spoke any language; English, French, Italian, Spanish, Swedish, Norwegian, it made no difference. We arranged a regular schedule of working in the morning and spending the afternoon walking in the park or taking a sightseeing bus to various parts of Berlin and its surroundings.

Chapter XII

Germany – 3

Our arrival in Berlin to spend the academic year 1937–38 half in Berlin, half in Munich on a Guggenheim Fellowship was just nine years after I spent the academic year 1928-29 in Munich as an Exchange Student. But it wasn't the same Germany. Hitler had transformed the parliamentary government into a dictatorship by combining the offices of President, Chancellor, and Commander-in-Chief of the armed forces, and dissolving the Parliament. With his extraordinary gift of persuasive oratory, he spread hope and optimism and support for what he did. He cut down the centuries-old Linden trees on Berlin's "UnterdenLinden" in order to widen the street for enormous military parades with blaring trumpets and thousands of marchers. Unemployment was eliminated with jobs for everyone. Dr. Goebbels, the Minister of Propaganda and Public Information, controlled the press and published frequent articles extolling the wonders of the Third Reich such as paid vacations for all workers.

Meanwhile, Heinrich Himmler and his black-uniformed S.S. continued their secret terror. Our landlady, Frau Barz, told us about neighbors who had vanished mysteriously in the middle of the night. In Munich, I learned

that the Director of the Student Union—whom I knew from my student year—had been found murdered. I also heard of an estate south of the city that had been taken over by the S.S. It consisted of a large wooded area and a magnificent mansion all surrounded by a high fence. Barons, wealthy businessmen, high-ranking officers, and others who spoke out against the Nazi regime or refused to cooperate with it, were taken to the estate, handed a loaded pistol, and told to go into the woods. They were instructed to make a choice between having their belongings confiscated and themselves and their families thrown into the street and denounced as traitors to their homeland, or being honored with a state funeral and a family well provided and cared for. Of course, we had no way to verify these stories and we were careful to make no inquiries. I did have one run-in with Nazi officials when I was called to a tax office to explain why I had paid no taxes on money deposited in my name in a German bank by the Guggenheim Foundation. When I replied in fluent German and in a very positive manner, they dropped the matter.

In Munich, the Bavarians were not nearly so enthusiastic about Hitler's militarism as were the Prussians. When entering a restaurant, it had become advisable to raise the right hand and in a loud voice say "Heil, Hitler!" In

Bavaria, this greeting sounded very much like: "A Liter," with obvious reference to a liter of beer. I visited Professor Zenneck but he was not allowed to show me his laboratory. Armed guards stood at every entrance. When I called on Professor Sommerfeld in his university office and asked him how things were going, he rose and opened the door to his anteroom before replying. He wanted to make sure that his Nazi assistant was not there. As a Jew he was under constant surveillance, but because of his distinction and importance in training physicists he was reasonably safe.

On March 12, 1938, while we were in Munich, Hitler marched into Austria and annexed that country.

We had left Berlin to go to Munich early in March. We took the train by way of Stuttgart in order to visit my cousin Herbert Wagner, his wife Maria Louise, and their son Kurt. We spent two days in Stuttgart and entertained the whole family at a dinner party at our hotel. Not included was another cousin who lived in Stuttgart but was an ardent Nazi. Herbert was against Hitler but wisely kept quiet and went through the necessary motions to avoid attracting attention. In Munich we were fortunate to get a room at a small Bed and Breakfast place run by a very distinguished pianist. She gave regular concerts and taught at the music school but sought to increase her

income by taking a few house-guests. For us this was an ideal setup. While I continued work on my lectures and book, Justine took piano lessons and practiced for them. The lady herself was very well educated and we enjoyed many interesting conversations with her. Added to the attractions was the fact that her residence was within a very short distance of the English Gardens, the extensive park of wooded areas, lakes, and paths for bicycling and walking. I bought bicycles for us and we enjoyed many rides in the English Gardens and much longer trips of several days into the countryside to stay overnight in picturesque villages or in large cities. German cities provided bicycle paths through the city so that the automobile traffic caused no problems. There was only one other guest, a young college girl from England who had come to Germany for a year of study at the University of Munich. She also took music lessons and often went bicycle riding with us. Her name was Stephanie. She later married a Canadian and moved with him to Alberta, Canada. We still exchange Christmas cards with a letter.

Early in August we packed our trunk and sent it ahead to Amsterdam. We then alternated riding our bicycles for short distances and taking the train between these bike trips. In this way we saw the most picturesque parts of the trip down the Rhine Valley. We sold the bicycles and

took the train for the final stretch. In Amsterdam we embarked for New York from where we took the train to Boston. Professor Chaffee had advised us to live in Belmont, an attractive residential suburb north of Boston. Here we found an attractive unfurnished apartment on the ground floor of a double-decker. The landlord lived on the upper floor. Actually we lived here only one year. On one of our many Saturday walks in the 3,600-acre Middlesex Fells Reservation in Winchester, we came out on a hill overlooking a street named Hillcrest Parkway and the house opposite our location was for sale. We climbed down to look at it. While walking around it, the real estate agent—who lived next door—came out and showed us the interior. We liked it very much, both inside and its location opposite the Fells. The agent, Mr. Dingwell, said the price was $15,000. We explained that we had no money to buy it. On the next day he appeared at our Belmont home and said we could have the house if we paid him $500 and took over the $9,000 mortgage. This seemed possible. We raised the $500 by using Justine's retirement fund and arranged very low monthly payments for the mortgage. We bought the house and moved in, in the summer of 1939.

Chapter XIII

Harvard – The War Years

I began my career at Harvard in the fall of 1938 convinced that war was imminent in Europe. I received a friendly welcome by Professor Chaffee and Acting Dean of the Graduate School of Engineering, Harry Mimno. I was given a large office-research room in Cruft Laboratory near the lecture room. I proceeded to update the graduate courses in Communication Engineering by introducing transmission-line theory, wave-guides, microwave generators, and antennas. I designed, and our machine shop fabricated, wave-guides, crystal detectors, and microwave generators. This was possible due to the extraordinary skill of our head machinist, Harold Benner, who had come to Harvard from Waldoboro, Maine. I was surprised that I had to replace a dummy antenna consisting of a capacitance, inductance, and resistance by an actual transmission-line driven dipole. I derived the driving-point impedance and electromagnetic field of a center-driven cylindrical antenna using an improved integral equation approach, first formulated by E. Hallén and published by him in 1938.

I replaced the existing course on electromagnetic theory based on the classical approach—electrostatics, mag-

netostatics, direct currents, electromagnetic field of an infinitesimal dipole—by the approach I had written in my manuscript in Germany which was based on the systematic analysis presented by Warren Weaver in his course at Wisconsin and the direct introduction of Maxwell's equations as was carried out by Sommerfeld and Schumann. My manuscript was first mimeographed as notes for the students in the graduate course and subsequently published as a book entitled *Electromagnetic Engineering*. In a published review, it was described as a first introduction of basic physics into the field of electrical engineering.

After the war began in Europe and the involvement of the United States became increasingly likely, the need for officers trained in the new uses of electronics and electromagnetics—notably radar which had just been invented—became evident. In July 1941, a course for officers of the Signal Corps who were graduate electrical engineers was established at Harvard with Professor Chaffee as Director. This occurred just a month after the Radar School at M.I.T. was organized. The Harvard School was designed to provide a broad background in basic theory, the M.I.T. school then provided the practical use of instruments. All such work was to be kept deeply secret. It was assumed that the Germans knew

nothing about radar. In Britain it was hoped to deceive them about how the British Air Force was able to shoot down night-flying planes that bombed London by publicizing the story that British pilots spent all day in total darkness and that this provided them with night vision.

For some time, the United States Navy had been sending four or five well-qualified, high-ranking officers for a year of graduate study at Harvard leading to the degree of M.S. in Communication Engineering. In 1941–42, these officers invited the teaching staff in the relevant courses to a pre-Christmas tea at the residence of one of them. The date was December 7, 1941. The happy conversation among the officers, the Harvard faculty, and their wives was rudely interrupted by the announcement over the radio that Pearl Harbor was being bombed. The officers knew that in a very short time they would be on active duty at sea.

Immediately after the United States declared war, the Navy began sending officers to Harvard for pre-radar training. The rapid expansion of the course necessitated a greatly expanded teaching staff. This included faculty members from many educational institutions. At about the same time, the Radiation Laboratory at M.I.T. required a large staff of research personnel. Scientists were recruited from all over the country. I was asked to give up

my teaching and join the research staff, as was my brother Perc, then Instructor of Physics at Purdue University.

On the day that I was preparing to report to M.I.T., Professor Chaffee, Director of the Harvard Pre-Radar School, informed me that plans had changed and I was to continue on the teaching staff at Harvard instead of joining the research staff at M.I.T. Upon inquiring why this reversal of plans had been made, I was told that it was because I had relatives in Germany and might be influenced by foreign agents to disclose secret information in order to protect my relatives from harm by the S.S.

Since my brother had the same relatives, I asked Professor Chaffee if he had also been advised not to come to M.I.T. Professor Chaffee seemed perplexed by this question and said he did not know. My father then called Dr. DuBridge, the Director of the Radiation Laboratory, whom he knew personally since both had been on the faculty of the University of Rochester. Dr. DuBridge said he knew nothing about the matter and was unaware of any screening against those with relatives abroad. I then called my brother who was all packed and ready to come. Somewhat ironically, he was soon asked to join the first contingent to go to Los Alamos and begin work on the atomic bomb. That project was so secret that no one knew anything about it, and I corresponded with him at

a post office box in New Mexico as his address.

My teaching at the Harvard Radar School included both the regular graduate courses and the course at the Harvard Pre-Radar School. This continued to grow and in addition to me and Professor Mimno (who had been replaced as Dean of the Graduate School of Engineering by a distinguished Danish Engineer named Westergaard) we recruited Professor Wing from C.C.N.Y. We taught transmission lines, antennas, wave-guides, and ionospheric wave propagation. As the course continued to grow and be repeated several times a year, I was unable to lecture to all of them. I was then ably assisted by Lt. J.G. Charles Harrison, Jr., who lectured in my place in several of the courses. Lecturing to several hundred in the large Court Room of the Harvard Law School was difficult. There was inadequate blackboard space and the microphone that was provided was cumbersome.

My regular graduate courses in Electromagnetic Theory were given in the morning, those in the pre-radar course in the afternoon. One morning while lecturing to a hundred or more graduate students and a few advanced undergraduates in the large lecture room (which was later divided into two lecture rooms) in Cruft Laboratory, I noted that two high-ranking naval officers in full uniform were seated in the last row. I had no objection

to their visiting my course until they started conversing with each other. Obviously, this would distract the students sitting near them. Accordingly, I stopped in my lecture and said in a loud voice: "Will the two gentlemen in the last row please stop talking or leave the room!" Presumably nothing like this had happened to them before. A young instructor giving orders to high-ranking officers. They stopped talking immediately.

The pioneer paper by Professor E. Hallén had shifted my interest from high-frequency generators to antennas. I had incorporated simplified aspects of antenna theory into my lectures in the radar course and Lt. J.G. C. W. Harrison also became interested since he was giving the same material in his lectures. He had an excellent background for this work since, after attending the Coast Guard Academy, he had earned the Bachelor of Science in Electrical Engineering and the E.E. degrees at the University of Virginia. From October 1943 to June 1944 we wrote and published six papers on antennas including types of interest to the military which Harrison suggested.

After the invasion of Normandy, the war became predominantly a ground war and the Radar Courses were terminated. I then had time to learn who my new colleagues were. The Graduate School of Engineering had been established very recently after Harvard received a

large gift from a noted Mechanical Engineer named Gordon McKay. Harvard had received half of the money outright with the provision that it be used to establish a school of engineering with special attention to mechanical engineering. The income from the second half of the bequest was to go to two lady friends of McKay as long as they lived and then go to Harvard. Harvard had, accordingly, established the Graduate School of Engineering with a full range of engineering departments, each headed by a distinguished engineer-scholar. The Head of Electrical Power Engineering was Professor Rüdenberg, a distinguished German engineer who had left Germany before the war since he was Jewish. The Head of Sanitary Engineering was Professor Fair, the Head of Soil Mechanics was Professor Casagrande. There were several distinguished scholar-engineers in mechanical engineering and applied mathematics.

There was a small group of scholar-teachers that held joint appointments on the Gordon McKay Endowment and the Department of Physics. These included Professor E. L. Chaffee in Electronics and Electron Tubes; Associate Professor H. R. Mimno in Ionosphere Research and Wave-Propagation; Assistant Professor F. V. Hunt in Acoustics; Roger Hickman, Lecturer in Electronics, and now me: Assistant Professor of Communication En-

gineering and Applied Physics.

In the Physics Department at the time were Professor Kemble in Theoretical Physics; Professor Oldenberg; Professor Bridgeman in High-Pressure Physics; Professor Bainbridge, and Professor J. H. Van Vleck who had joined the Harvard Faculty from Wisconsin at the same time I had. A very recent addition was Professor Julian Schwinger who had led the research group at M.I.T. There were also Assistant Professor Wendell Fury and Assistant Professor J. Curry Street. This was a very impressive faculty. But I soon found out that they were not in the least friendly. This was true of the senior faculty and of the assistant professors. I taught my courses in the morning, ate the sandwiches I had brought from home and drove back home—about six miles. When I learned that Professor Mimno did the same, I joined him in his office for lunch.

In February 1941, Justine gave birth to a baby boy whom we named Christopher Merrell King. She was in the hospital when I had our belongings moved from Belmont to Winchester. When I brought her home, a new life began for us—owning a home and caring for a baby boy. Our hope to have additional children was not fulfilled despite the best of medical advice. Chris turned out to be highly musical. His fourth-grade teacher took her

class to her home after school once a week to given them light refreshments. Since she was the wife of a funeral director, she had plenty of space for this. To her surprise, as she reported to us, Chris was more interested in the small electric organ in the funeral parlor than in the cookies. He put together notes that were harmonious and did this with different stops. We forthwith gave him piano lessons with a Mrs. Bolster who lived near us. A year later he started organ lessons and got permission to practice on the pipe organ in the Unitarian Church. After all, his great grandfather, Reinhold Seyerlen, had been Professor for organ at the Conservatory in Stuttgart, Germany, and his mother had studied piano in Munich and sang in the church choir.

Since Professor Chaffee had advised me "not to waste time on teaching since all promotions at Harvard depended on research and not on the quality of teaching," I spent a great deal of time on research, primarily at home. However, I did not neglect my teaching. I remembered my father's long preparation for his German courses and the interest he took in the progress of each individual student. Lecture courses in physics and electrical engineering are quite different from courses in the humanities, but I gave frequent one-hour examinations, instituted regular laboratory experiments to illustrate the lectures, and tried to

get acquainted with the students in the laboratory. This procedure differed markedly from that common at Harvard with the professor giving the lectures and teaching fellows supervising the laboratories and grading the one test in the course, the three-hour final examination.

Since I taught only graduate courses for students working for Master's and Doctor's degrees, the material I presented was advanced. Unlike many professors, I did not present the same material each year but continually upgraded the contents by including newly published advances, including my own researches, that of new Ph.D. dissertations, and the related publications in technical journals.

Graduate students at Harvard were all highly talented. Newly entering students were assigned by the Admissions Committee to advisers whose field of interest was related to that of the entering students where such an interest was expressed. Otherwise, they were assigned at random. A few students specified the professor they wished to work under. I took great pains with my advisees to find out their interests and talents and help them select the courses that would expand their knowledge in the fields of their interests.

Chapter XIV

Teaching and Learning, Teaching and Research

It was only three years after I joined the Harvard Faculty before two Chinese students started their thesis work under my direction. They were Yu-Yueh Alva Mao and Way Dong Wu. They earned their Ph.D.'s in 1944. Closely following those two was another Chinese student, a very brilliant recent arrival named Chen-To Tai. He wrote a distinguished thesis on coupled antennas and transmission lines. After three years of post-doctoral research at Harvard, he went on to Stanford Research Center for three years, became Professor at the University of Michigan, visiting professor at a university in Brazil, and ultimately retired as one of the most distinguished educators and scholars in the world.

Simultaneously with Chen-To Tai was my much younger brother Don. He graduated from Harvard College with a major in physics and wanted to continue to earn a Master's Degree and Ph.D. in electromagnetics. I had just become aware of a controversy over the impedance of a thin-wire antenna. In England, measurements had been made with a center-driven dipole antenna located horizontally, high above the earth. In the

United States measurements had been made on a base-driven monopole erected on a large metal ground plane. They differed significantly. Which was right? I suggested to Don that he study the problem both experimentally and theoretically. He was pleased to do this. His work resulted in two papers: "Terminal Functions for Antennas," *J. Appl. Phys.* **15**, 186–192 (1944), and "Microwave Impedance Measurements with Application to Antennas," *J. Appl. Phys.* **15**, 524–535 (1944). These showed conclusively that the differences in impedance were due to the different driving conditions—center-driven by a two-wire transmission line on the one hand, and base-driven from a co-axial line on the other hand. These different end effects lead to quite different apparent impedances as determined by measurement on the transmission lines.

Don wrote up his complete work as a Ph.D. thesis and submitted it to the faculty. He gave a very complete lecture explaining his work in defense of his thesis and was voted the Ph.D. degree unanimously with me abstaining. Don moved on to become Assistant Professor at the Johns Hopkins University and, shortly thereafter, President of North-American Phillips in Chappaqua, New York. He served in this position for many years and died prematurely from a brain hemorrhage after a strenuous game of tennis. He had just been nominated by the IEEE to

become its President.

In the academic year 1948, there were eight new Ph.D.'s. It was a distinguished group and included men with interests as diverse as those of Charles Papas and Patrick Conley. Papas was a brilliant research man and he and I collaborated on numerous researches during his stay at Harvard as a Post-Doctoral Fellow. These resulted in four published papers. From Harvard, Papas joined the faculty of the California Institute of Technology and in due time advanced to the rank of Professor.

Also, in the 1948 group was Patrick Conley. He went to the Harvard Business School and founded the Boston Consulting Group, one of the top engineering consulting groups in the country.

In 1950, Harvard received the second half of the Gordon McKay Endowment and the President, Mr. J. B. Conant, appointed a panel of four engineers and scientists to review the conditions of the McKay gift and decide whether it should be turned over to the Faculty of Engineering or otherwise allocated. The report turned out to be a 31-page discussion of all possibilities. It explained that since Gordon McKay made the gift, times had changed. Mechanical engineering had expanded to include aeronautical engineering and materials science. Nuclear science, computer science, and the science of elec-

tronics with its many applications had come into existence. It concluded that all of these would be included by McKay if he were alive. It made one exception. Harvard should not use the McKay bequest "to advance the applied science of communications." Thus, the area of communication engineering which I had developed in my courses and my research, and that of numerous graduate students and their Ph.D. theses, was not to be a beneficiary of Gordon McKay funds. President Conant called a special meeting of the Faculty of Engineering and announced that the Gordon McKay Endowment would not be turned over to it. Thereupon, Dean Westergaard reminded Mr. Conant that he had been promised the funds by Mr. Conant. The President coolly replied that he had changed his mind. Dean Westergaard promptly resigned and left the university. Members of the Faculty of Engineering were then invited to join the Faculty of Arts and Sciences. Since my appointment had been a joint one in Physics and Communication Engineering, I was already a member of the Faculty of Arts and Sciences. The Graduate School of Engineering was diminished in size and continued for a number of years with Professor Fair, Head of the Department of Sanitary Engineering, as Dean. Ultimately, it was continued as the Division of Engineering and Applied Physics under the Faculty of

Arts and Sciences.

The Division of Engineering and Applied Physics has successively had three theoretical physicists (not engineers) as Dean. The first of these was J. H. Van Vleck, whose course I had taken at Wisconsin and for whose book, *Electric and Magnetic Susceptibilities*, I had helped correct the page proofs. He had no interest in or understanding for engineering and strongly resented the very substantial financial support my research group received from the Defense Department in Washington through a committee called the Joint Services Committee. It consisted of quite knowledgeable engineers from the Army, Navy, and Air Force. They visited Harvard once a year, and discussed our on-going researches with us. We also wrote up, as a final report, completed researches and sent these to them in Washington in the form of a bound technical report. After he had been Dean only a short time, Van Vleck called the Joint Services in Washington and asked them to send a representative to Harvard to discuss with him the reallocation of the Joint Services funds that went to our group. He wanted as much of the money as possible to go to a group in solid-state physics that was being developed under his direction. After the representative had come and gone, Van Vleck was furious at me. He passed me on the bridge with a scowl and not a word.

I learned later that the representative from Washington had informed him that our researches in communications and electromagnetics were very important for the Defense Department and of very high quality. They did not want our work disturbed.

Van Vleck's next move was to change the instructor for the graduate course on "Transmission Lines and Wave Guides" from me to a newly appointed member of the faculty, Lester Hogan, without consulting me. When I discovered this, I went to him and asked him whether he was planning to change the instructors of my graduate courses on "Electromagnetic Theory" and "Antennas." I told him that if that were the case, I would withdraw from teaching them immediately and transfer my research activities and those of future graduate students to a new and different field, viz., Surface Phenomena, which had recently developed into an interesting one. He seemed somewhat startled and after a long pause replied that this was not the case and he expected me to continue teaching the courses and doing research in electromagnetic theory and antennas. Van Vleck was replaced by Harvey Brooks as Dean of Engineering and Applied Physics shortly thereafter and Hogan accepted a managerial position in the Texas Instruments Company. I then resumed teaching the course on "Transmission Lines and Wave Guides."

One of the graduate students writing his Ph.D. thesis under Professor Van Vleck's direction was a young man named David Middleton. Although his thesis was on a topic in theoretical physics, he did attend my graduate course on "Transmission Lines and Wave Guides." Some time after I had given the course, Middleton came to me and proudly showed me the proofs of a paper that had been accepted for publication by the *Journal of Applied Physics*. It was entitled, "Transmission-Line Theory Applied to Wave-Guide Theory and Cavity Resonators," and was authored by David Middleton. As I glanced through it I realized that it reproduced my lectures almost verbatim. I turned to Middleton and in a not unfriendly manner said it looked like a very nice paper, but did he think it appropriate for him to publish my lecture notes under his name. He replied, "But I wrote it, didn't I?" I replied, "Yes, you copied it from the blackboard and arranged it into a paper, but were the ideas yours? Did you develop the analysis?" He reluctantly replied, "No." I then smiled and said, "Don't you think it would be a good idea to put me down as a joint author?" He quickly agreed and the paper was published in July, 1944, authored by Middleton and King. Since David had outstanding mathematical ability, I asked him if he would like to work on another joint paper, this one in antenna

theory. He was happy to do this and I set him to work on an improvement in the analytical procedure in Hallén's work on the linear antenna. By choosing a better kernel in the integral equation, a good approximation of the current distribution and impedance could be obtained without many iterations. Middleton carried out the suggested procedure very effectively and the paper was published under the title, "The Cylindrical Antenna: Current and Impedance," in the *Quarterly of Applied Mathematics* in January 1946, authored by King and Middleton.

In this period I summarized and expanded my lectures and my research and that of my Ph.D.'s in several books. These included: *Transmission Lines, Antennas, and Wave Guides* with H. R. Mimno and A. H. Wing in 1945; *Electromagnetic Engineering* in 1945; *Transmission-Line Theory* in 1955; *The Theory of Linear Antennas* in 1956; and *The Scattering and Diffraction of Waves* with T. T. Wu in 1959.

In 1953 a Chinese student named Tai T. Wu applied for admission to the graduate school. He had earned his B.S. degree at the University of Minnesota in Minneapolis with very high grades. But the Admissions Committee in the Division of Engineering and Applied Physics was not impressed. They told me in answer to the question, what he did for recreation, he had written the one word "Go."

Professor King in 1963, behind McKay Laboratory with Professor Tai Tsun Wu and graduate student Liang C. Shen.

They said that anyone who just wanted to go couldn't be very bright. However, when I told them that this was an ancient Chinese game and one of the most difficult in the world, he was admitted. After a year of graduate work he earned his Ph.D. in 1956. His work was so outstanding that I recommended him to the Harvard Society of Fellows for a Junior Fellowship. This provided complete support for three years for continuing research. He was awarded a Junior Fellowship for the years 1956–59. I later learned that he had been recommended by another professor simultaneously with me. During these three years, he also carried out research at the Institute for Advanced

Study in Princeton, New Jersey, at Brookhaven National Laboratory, at Stanford University, and at Bell Telephone Laboratories.

In the spring of 1958 I had a sabbatical leave and a Guggenheim Fellowship. Before leaving for Europe I told Dean Brooks that since I was the only one teaching courses in electrical engineering, there was no one on the faculty available to teach my courses. Actually I had to ask a graduate student still working for his Ph.D. to substitute for me. When I returned in the fall I again went to Dean Brooks and recommended that T. T. Wu be appointed Assistant Professor. He agreed to do this and in the fall of 1960 T. T. Wu became Assistant Professor. After serving his full five-year term he had to come up for promotion to a tenure position as Associate Professor or leave the University. I wrote a strong recommendation for him and President Pusey appointed a committee of outside scholars and scientists to study the case and make a recommendation. In due time, the President called another meeting at which I was to testify, along with Associate Dean Wallenbrock, representing Dean Brooks. I described his qualifications and accomplishments in some detail. Wallenbrock objected vigorously to his appointment. He maintained that Wu's lectures were incomprehensible and disorganized.

The President then said that his panel and, in particular, J. R. Oppenheimer had very strongly recommended Wu and stated that he was one of the most outstanding young scientists in the world. He concluded that under the circumstances he had no choice but to recommend him to the governing boards for promotion to Associate Professor. Wu was the only person I succeeded in advancing to a tenure position. Several of my Ph.D.'s became assistant professors. This included a young visitor from Germany who came as a Post-Doctoral Fellow and became Assistant Professor. His name was Dr. Hans J. Schmitt. After leaving Harvard he became professor at the University of Aachen in Germany. This is one of the most prestigious professorships in Germany.

In 1961, a Japanese student named Keigo Iizuka earned his Ph.D. with a thesis entitled "A dipole antenna immersed in a conducting region." His small stature and jovial expression made him look so young that he was denied a glass of beer "because he was under 18." He became a professor at the University of Toronto in Canada and is the author of a two-volume book entitled *Elements of Photonics*. In 1963, a Greek student named John Fikioris (the father of George Fikioris referred to later) got his Ph.D. degree. He then joined the faculty of the University of Toledo, OH, where he advanced to a

full professorship. He was then invited back to Greece to become Professor at the National Technical University of Athens. In 1973, a young Indian woman named Bharathi M. Bhat completed her Ph.D. with a thesis on antennas in a magnetoplasma. She returned to India and became a full professor at the University of New Delhi.

Around the late 1960's or early 1970's, I was informed by the Division Secretary that the Admissions Committee had informed all applicants who specified electromagnetics as their principal field of interest that this field was no longer available and that their applications were, therefore, rejected. This meant that some very brilliant students were refused admission. Upon inquiring from members of the Committee why this step had been taken, they replied that it had been ordered by Dean Brooks. When I inquired from Dean Brooks why he had given this order, he replied that it had been requested by the Dean of the Graduate School. This was obviously not true, but the damage had been done. Brooks took this course to reduce the flow of students that wanted to work for their Ph.D.'s under my direction. Thus, Brooks succeeded in doing what Van Vleck had tried to do by cutting off Defense Department funding. Actually, Brook's order had a very small effect since most applicants didn't specify the area in which they planned to pursue their Ph.D. work.

The stream of graduate students who decided to work for their Ph.D. degrees continued even as my retirement as an active professor approached. The official rule set age 67 as the retirement age but permitted five additional years for those physically and intellectually able. In September 1972, I reached the age of 67 and President Pusey, as required by the Harvard rules, came to my office in McKay Laboratory to thank me for my services and announce my becoming a Professor Emeritus. I requested permission to continue for five more years, pointing out that I was well able to do so. He curtly replied that Dean Brooks had requested that this privilege not be granted. He added that he was obliged to accede to Brook's request. At the time I had five or six graduate students in various stages of the Ph.D. research. One of these, Stuart Long by name, led several others to ask for a meeting with President Pusey at which they requested that I be permitted to continue for another five years. President Pusey denied the request.

Fortunately, this did not mean that I had to stop abruptly advising graduate students who wished to work for their Ph.D. under my direction. The official rule provided that each candidate for the Ph.D. must work under the supervision of a committee of three or four members of the faculty who met periodically to review the candi-

dates progress. There was no rule preventing Professors Emeriti from being members of such a committee. However, they could not be the actual advisor who was the chairman of the committee. Students in the future had to be accepted by T. T. Wu. He was happy to do this with students who wished to work with me and those who wished to work with him. As a consequence, I continued advising Ph.D. candidates much as before my retirement.

In the years preceding my retirement, I followed my usual practice of consolidating lectures and researches in books. These included, *Arrays of Cylindrical Dipoles* with S. S. Sandler and R. B. Mack in 1968; *Antennas and Waves: A Modern Approach* with C. W. Harrison, Jr., in 1969; and *Tables of Antenna Characteristics* in 1971.

The final event at my retirement was a dinner given in my honor by a large number of former Ph.D. students. Dean and Mrs. Brooks were also invited as well as some members of the faculty. Justine and Chris were also there. The Master of Ceremonies was Chen-To Tai. He presented me with the Golden Dipole Award which consisted of a short section of coaxial-line in the form of a polished brass tube terminated in a short dipole. It was customary for the Dean and the Faculty to give a retirement dinner. However, in my case, Dean Brooks decided this was unnecessary since the former students had done so.

Chapter XV

The Post-Retirement Years

Although I could no longer give lecture courses, my teaching career did not end. In addition to lecture courses there was another type of course, the Reading course. This could be given by any member of the faculty—active or retired. Such a course was intended to fill in any gaps in the knowledge of a student as required by his prospective Ph.D. work. It consisted of regular one-on-one meetings between professor and student in which the professor assigned reading and problems and then questioned the student at the next meeting and explained what the student hadn't understood. I was happy to give such a course since my lecture courses were no longer available and students were sent to M.I.T. to take courses there on electromagnetic theory and antennas. These were much more superficial and incomplete, especially in antennas. Actually M.I.T. had sent their students to Harvard to take my antenna course while I was active.

In the 1970's my interests had moved from antennas in air to antennas in the earth and in fresh and salt water. An interesting application was communication with and detection of submerged submarines. My theoretical results were confirmed by the U. S. Navy on the arctic ice.

Our numerous researches and published papers were contained in the thick book, *Antennas in Matter: Fundamentals, Theory and Applications*, which was published in 1981 and authored jointly with G. S. Smith. The 1980's were devoted primarily to communication over the surface of the plane earth and sea with special attention to the mathematically complicated problem of the surface wave known as the lateral wave. This led to the book, *Lateral Electromagnetic Waves: Theory and Applications to Communications, Geophysical Exploration and Remote Sensing*. It was authored by R. W. P. King, Margaret Owens and T. T. Wu.

The appearance of the name Margaret Owens as one of the authors introduces the subject of secretaries. In my early work, notably the typing of the manuscript of my first books, the young women who did the typing were just typists. It was left to me with the help of some graduate students to correct the final version of the manuscripts. In the 1960's this changed. My secretary was a college graduate and physics major named Dilla Gooch (Tingley). She was able to check my manuscripts for errors. I also encouraged her to participate in some researches, which she did. She appears as joint author in two papers. Dilla left a few years before my retirement and in 1967 I appointed a young girl, Margaret

Owens, who had just graduated from Smith College with a major in religion and only one college-level course in physics. Surprisingly, she developed a strong interest in the preparation of the long manuscript for the book *Antennas in Matter*. She made significant contributions to the clarification and coordination of the manuscript and to its technical correction. This work is acknowledged by her name appearing on the title page, not as an author but as a helper. In time, she developed remarkable understanding for technical material and was able to check complicated equations in papers and books. As a consequence she was a joint author of the book, *Lateral Electromagnetic Waves: Theory and Applications to Communications, Geophysical Exploration, and Remote Sensing*. After my retirement she became T. T. Wu's secretary and his papers and books took priority. However, she did find time to work on my papers. Actually, many of these were joint papers with T. T. Wu. His interests were primarily in theoretical physics, especially high-energy physics. Since his wife, Sau-Lan, spent most of her time at the European research center at CERN, Switzerland, he arranged to be over there one semester and the summer each year, and to teach at Harvard only one semester.

In the 1990's only four students earned the Ph.D.

These worked primarily with Wu. One of them, a student from Greece named George Fikioris, was the son of a much earlier Ph.D. of mine, John Fikioris, who was professor at the National Technical University of Athens. George wrote a theoretical-experimental thesis analyzing the properties of a novel resonant circular array of up to ninety elements which had been invented by Wu. It had unusual properties of great interest to me since they suggested several practical applications as a microwave beacon.

A second Greek student named Vassilios Houdzoumis worked primarily on a subject in theoretical physics but at my suggestion he included a mathematically difficult topic, the propagation of the electromagnetic field of a vertical dipole near the curved earth. He derived surprisingly simple formulas for the propagation of the surface wave with direct application to communication with ships at sea and for communication with submerged submarines. Earlier work had applied only to distances for which plane-earth formulas were adequate.

The last student to do his Ph.D. research with Wu and me was another student from Greece named Dionisios Margetis. He took the graduate course on Electromagnetic Theory at M.I.T. and then a reading course with me. As a first topic I assigned my book on electromag-

netic theory with its quite different approach. He was very interested and soon discovered not only great differences but previous errors in the M.I.T. book. He had unusual mathematical talents and soon contributed significant original research on wave and pulse propagation into the sea and earth. He was a brilliant mathematician with a keen sense for practical application. He wrote his thesis under Wu's direction and went on to be appointed to a tenure-track instructorship in mathematics at M.I.T.

When Dean Brooks retired shortly after my retirement, he was succeeded by another theoretical physicist, Paul Martin. I had no contacts with him until his retirement in the late 1990's. His successor was an Indian with the long name Venkatesh Narayanamurti, which he abbreviated to Venky. My contact with both Martin and Venky came when I returned from my usual summer in Maine in September. Wu was still at CERN. When I went in to my office on the third floor of McKay Laboratory, I was dumbfounded to see a crew of workmen in the adjacent large research room in which was a large vertical metal ground screen and long tables with research equipment. The men were in the process of demolishing the ground screen and carrying out the tables and everything upon them. I was informed that in spite of the fact that a large new building had been completed specif-

ically for engineering and applied science, Venky wanted our eight rooms in McKay in addition. Our group was to be moved to the fifth floor. When Wu returned from Switzerland, he and I visited Dean Venky and inquired why his group couldn't find space in the new building or at least take the fifth-floor space and save us the move. But he was adamant. His group of graduate students and post-doctoral fellows that would soon arrive from California needed more space than was available on the fifth floor. Moreover he wanted my office for his personal use in addition to his Divisional Office in Pierce Hall. In the following weeks all of our belongings were moved up to quite pleasant, although much smaller quarters on the fifth floor. This was my concluding contact with Harvard deans.

Chapter XVI

Politics and International Affairs

With a Canadian father and a German mother who had never lived in the United States, it was natural that with a quite different political structure from those of Canada and Germany, this would be a frequent topic of discussion. My earliest recollection was my parents' discussion about President Woodrow Wilson who traveled to Europe to establish the League of Nations and was repudiated by Congress and his own party. This could not happen in Canada or Germany with their parliamentary systems of government.

My second recollection was World War I. In our little family this produced a house divided. My father believed it had been started by Austria with which Germany was allied. My mother believed it was British imperialism which sought to prevent Germany from establishing a colonial empire like that being constructed by British sea power.

As I grew older, my own interest in and understanding of political events in the United States and Europe developed. This grew rapidly when I spent the academic year 1928–29 in Germany as a graduate student. Living on

the same floor with students from other countries, having meals with them and taking long bicycle trips with them into the Bavarian Alps, all these activities developed my interest in international affairs. Actually, at the time I was too preoccupied with my graduate work to pay much attention to world affairs. However, it all provided a background for future interest.

It was my second trip to Germany as a Guggenheim Fellow in 1937–38 just before joining the Harvard Faculty that suddenly immersed me in the midst of exploding world events. Hitler and his storm troopers, Goebbels and his deceptive speeches, bus loads of peaceful citizens on their way to free "vacation trips," these all combined to make me feel that they were like the black clouds that brought a terrific thunderstorm. The storm began before we could leave Germany when Hitler invaded Austria. But we took a ship back to the United States before the world was engulfed in war.

Back at home I was glad the United States had a strong leader in President Franklin Roosevelt. I was proud to vote for him four times. I was also pleased that it was Harry Truman who completed Roosevelt's fourth term and was elected for another term. It was during Truman's presidency that a young congressman named Richard Nixon organized an Un-American Affairs Com-

mittee to investigate communist activities in the United States. This concerned me since he accused one of my colleagues at Harvard of being a member of the communist party. Truman handled the situation well by simply denying that there were any communists in his government. I was deeply disappointed that Governor Adlai Stevenson of Illinois was defeated by General Eisenhower. Stevenson had a brilliant mind and was a very skillful administrator. He could have been one of America's most distinguished presidents. On the other hand, Eisenhower had a military mind and I felt he ran the country more from the golf course than the Oval Office.

I was quite surprised by President John F. Kennedy. When he was elected I felt this had literally been bought by the Kennedy millions and that he would turn out to be a do nothing president. Hence, I was surprised and pleased with his decisive action with the Bay of Pigs. I recall very clearly that I was at a luncheon meeting in the Harvard Club of Boston to discuss technical problems when the news came over the radio that President Kennedy had been assassinated. What a tragedy!

The Johnson administration that followed Kennedy's was soon embroiled in the Vietnam War and the controversy of whether the United States should intervene after the French gave up and withdrew. I felt that President

Johnson did the wrong thing. It was not of national importance to intervene.

Nixon's pledge to the American people that he would bring the Vietnam War to a quick end did not impress me, but won him the election and the presidency. I remembered him from the Un-American Affairs Committee and didn't trust him. However, he brought the war to an ignominious end for the United States. His presidency was, of course, a national disgrace. However, after having watched him on television with his Un-American Affairs Committee, I was not surprised by his ruthless disregard for the laws of his country and the privacy rights of the individual. His successor was Gerald Ford, Speaker of the House of Representatives, since there was no vice-president—he had been indicted for fraud.

I was happy and proud of my fellow Americans when they reacted prudently and elected Jimmy Carter for president. After reading several of his books relating aspects of his childhood, early life and election to Governor, I felt he was the right choice and an antidote to Nixon. Carter was a genuinely good man but unfortunately completely inexperienced in the rough and tumble politics of Washington, D. C. In many respects his presidency was a failure and he was no match for his glib and politically skillful successor, Ronald Reagan. I voted for

Carter because I believed he would do well in a second term. His prolonged unsuccessful attempts to obtain the release of the American hostages held for ransom by the ultra-conservative régime in Iran, probably cost him the election. Carter had a good mind and I believed he would learn by experience and have a successful second term.

Actually, I was pleased that Carter's successor was Reagan. He had been an outstanding Governor of California and promised to be an outstanding president. This turned out to be true for his first term and he well deserved a second term. Unfortunately, this developed an unexpected turn in the Iran-Contra scandal which led to a long congressional investigation with numerous people testifying including Oliver North. The fact that Reagan denied any knowledge of the matter, as did others in his administration, was a great disappointment to me. Like most Americans, I watched the hearings on television and it was an unreal, unhappy disaster for Reagan's presidency. However, Reagan was unabashed and gave long speeches about completely irrelevant events. His warm and friendly personality was irresistible so that he had few enemies. In a way, this was a blessing for the country. Surprisingly, Reagan was never required to testify in court for deceiving Congress. His vice-president and successor later pardoned Reagan's Cabinet Officers before

they were brought to trial for criminal activity.

Simultaneously, with this sequence of domestic politics, there were important developments in foreign affairs, notably the antagonism and distrust between the United States and the Communist Soviet Union. This was called the Cold War. Jimmy Carter, while president, tried to alleviate this antagonism in a long meeting with the Soviet Dictator, Nikita Khrushchev. Carter did his best, but his Christian philosophy made no impression on Khrushchev and the meeting was a failure. Reagan was more successful with the successor to Nikita Khrushchev, Mikhail Gorbachev, who actually wanted a rapprochement with the United States. In a meeting in Iceland, Reagan challenged Gorbachev to tear down the Berlin wall separating East and West Germany. Gorbachev had already visited England and had talked with Winston Churchill. Somewhat to Reagan's surprise, Gorbachev quickly agreed and effectively ended the Cold War. Unfortunately, Gorbachev was repudiated by his own country and Boris Yeltsin became the new Russian leader.

Chapter XVII

Life at Home

During these post-retirement years, life at home continued in a normal manner. This was true of both Winchester and Rockport, Maine. Then, while at the cottage in Rockport, Justine suddenly felt extremely ill. I quickly drove her to the nearby Pen Bay Hospital where they put her in bed and the doctor diagnosed it as a stroke. She was hospitalized for a week and then released with the instructions to resume life as usual. The following year, 1984, it happened again. I took her to the Harvard University Health Services in Cambridge and they diagnosed it as a severe stroke and rushed her to the Massachusetts General Hospital in Boston. She was in bed there for nearly two weeks. She had lost much of her memory and hardly recognized me. I visited her daily and talked to her about familiar things. She very gradually became more attentive and when she was discharged, she could walk and attend to her personal needs. Life at home became difficult. She could not be left at home alone. She always wanted to go for drives and her memory of locations steadily improved. She always had loved group singing and had been a member of the Jenks Senior Center Choral Group. So on their rehearsal days, I

left her there while I went to the Laboratory. She also was a member of a bridge group and managed to play after her stroke. I arranged to take her to and pick her up from the particular house at approximately the right time. However, after a time the group refused to play with her. There remained nothing I could do except take her with me to the laboratory where she would sit at a desk opposite mine and look at magazines.

After a time, the nurse at the Jenks Center inquired if it would not be easier for me to have a woman come to our house and take care of Justine while I was at the laboratory. I thought it worth a try and she said she would have someone call and make an appointment. A few days later the call came and I invited the caller to visit us at 92 Hillcrest Parkway. The person drove up and rang the doorbell. I invited her in. I was quite surprised. The person who came in was no ordinary woman but a distinguished looking lady. She was beautifully dressed and had a pleasant smile. Her name was Mary Govoni and she was a widow. I learned later that after her husband died, she felt a need to be active so she became a volunteer at the Jenks Senior Center. One day the nurse at the Center inquired whether she would be willing and interested to help a Harvard professor with an invalid wife continue his work at the University by staying with his

wife at their home. Happily, she agreed to do this.

Mary came in and we three sat together in the living room. Both Justine and I liked her and arranged for her to come twice a week for the morning and early afternoon. She would prepare a light lunch for herself and Justine. She charged $10 an hour, which I was happy to pay for such a pleasant companion.

When the summer approached, I described and showed pictures of the cottage and asked Mary if she would be willing to accompany us. She agreed to do this. We spent a happy summer together. She joined us at the weekly concerts and walked with Justine at the cottage when we drove down the steep hill in my all-wheel-drive Subaru. I cut down trees and cut them up for firewood. That year worked out fine and also the next summer until, in late August 1990, Justine died in her sleep. She was buried in Maine in the family plot in Waldoboro.

Mary and I drove back to Winchester alone. She to her condominium, I to 92 Hillcrest Parkway. Chris had driven to Maine and then stayed with me a few days a week. I felt lonely and depressed but gradually recovered and started research and long stays at the laboratory. After a time I missed Mary and started to visit her at her condominium. We went for walks together in the woods off Hillcrest Parkway. She was a great walker and

Mary and Ronold King in 2003.

we enjoyed our walks together. After a time, I fell in love with her and proposed to her. She was non-committal. I repeated my proposals four times and then she finally said yes in the fall of 1991. We were married in June 1992. We have now lived together for ten years and these have been the happiest days of my life. Mary is a thoughtful, helpful, affectionate and loving wife and companion.

In her usual friendly manner, Mary encouraged me to continue my research work. A subject quickly came to my mind. I recalled the evenings when we sat on our porch at

the cottage to watch the brilliant reflections of the sunset on the clouds above Penobscot Bay. I also recalled a few evenings over the years past when we saw fog roll in and enter Rockport Harbor, completely hiding the flashing red light at the end of the Indian Island reef. I noted that it was high tide so that most of the reef was underwater. Finally, the fog became so dense that we could not see the trees in front of the cottage. I wondered what a boat would do if it tried to enter the Rockport Harbor coming from Camden. It could not see the flashing red light until very close and its radar—if it had one—could not detect the submerged part of the reef. It might easily strike the reef with its keel before the captain realized he had turned too soon.

It occurred to me that this was an ideal place to make use of the newly invented resonant circular array of 90 elements to provide a microwave beacon to supplement the flashing red light. I readily designed a practical array operating at 3 GHz or a wavelength of 10 cm. This would rotate at a slow speed to provide two microwave flashes per minute to correspond to the two flashes per minute of the Rockport red light. Since microwaves penetrate fog, they could be received by a boat equipped with a microwave receiver. The signal would be modulated to give its location. It would be received miles away and

permit the boat to enter Rockport Harbor without seeing the red light. A complete description of this device is published in the March-April 2002 issue of *Radio Science*.

Since coastal airports from Rockland, Maine to Long Island, New York are also subject to dense fog, a straightforward modification of the microwave beacon to supplement airport lighting and the glide path for approaching aircraft could be made. I carried this out in a paper published in the February 2003 issue of the *IEEE Transactions on Antennas and Wave Propagation*.

As a final note, it is appropriate to conclude with a review of the recognition which my work has received.

1973 — The University of Wisconsin presented me with the Distinguished Service Citation with the words:

> *Ronold W. P. King, Electrical Engineer and Teacher who through insight and analysis, scholarship and inspiring instruction has made significant contributions to engineering education and the engineering profession.*

1984 — I received the IEEE Centennial Medal with the citation:

> *Ronold W. P. King is honored for extraordinary achievement and is deserving of special recognition by the Institute of Electrical and Electronics Engineers, Inc. and is hereby awarded the IEEE Centennial Medal. Presented during the Centennial Year 1984.*

1986 — The Moore School of Electrical Engineering of the University of Pennsylvania presented me with the Harold Pender Award with the citation:

> *To Ronold W. P. King for leadership in the development of electromagnetic antenna theory and for exceptional achievement in creating a large and distinguished group of doctoral graduates whose integrated impact on academic excellence and societal progress is experienced worldwide.*

1991 — The Antennas and Propagation Society of the IEEE presented me with the Distinguished Achievement Award with the citation:

> *To Ronold W. P. King for over half a century of outstanding contributions to the field of electromagnetics particularly in the area of linear antennas; for his exemplary standards in research and teaching and, above all, for a lifetime of dedication to his students.*

1997 — I received the Leon K. Kirchmayer Graduate Teaching Award of the IEEE with the citation:

> *For exemplary standards in teaching and research, and for a lifetime of dedication to his students.*

2001 — I received the Chen-To Tai Award from the Antennas and Propagation Society of the IEEE with the citation:

> *To Ronold W. P. King for outstanding services to education in the field of antennas and propagation.*

I am most grateful for this broad-based recognition of a lifetime of teaching and research.

Appendix A

Sermon Written and Preached by Rev. Wm. C. King

This sermon was handwritten by the Reverend William Colsell King of Oxford, and was preached by him on July 5, 1795 at Newnham, Gloucestershire, England; on July 12, 1797 at Faringdon, Berkshire, England, and at Coxwell, where he was Curate; and on April 23, 1831 at Christ Church in Windsor, Nova Scotia, Canada, where he was Rector. This sermon is now on display at Christ Church.

In the 16 Chapter of the Gospel of St. Luke and at the 23 & 24 Verses.

And in Hell he lift up his Eyes being in Torment and seeth Abraham afar off and Lazarus in his Bosom... And he cried and said Father Abraham have mercy on me and send Lazarus that he may Dip the Tip of his finger in water and cool my tongue for I am tormented in this flame.

It is not in the power of Language to exhibit a picture more strikingly awful than that which these words present to the view. A fellow creature suffering torment exquisitely great aggravated by a distant sight of Glory

and felicity which he could never taste and begging for a little momentary suspension of his suffering, but denied that request with an assurance of utter impossibility of ever receiving the least alleviation. Can it be that a representation should fail of exciting our attention! Is it not to every one who partakes of our common Nature the most interesting of all possible inquiries *what* it was that drew such misery upon this wretched man.

There was says our blessed Savior a *certain rich man* but he has added nothing odious or disgraceful to the circumstance. He has not told us that this man was indebted for his riches to any criminal means or that he enjoyed with insolence what he had acquired by baseness the silence of Scripture justifying him in the particular. He was rich. He spent his riches on a round of peaceful enjoyment free from ambition surrounded with pleasures exempt from care and how few are there at this day in the world who possess the goods of fortune on more innocent circumstances! (Nevertheless, mark the first cause of his destruction! He was rich.)

He was clothed in purple and fine linen. Yet we do not find that in his pomp he spent more than his income—that the tradesman or the artifices were sufferers by his ostentation and extravagance—we do not learn that he regarded his equals or inferiors with an eye of contempt

or that plunder was employed to nourish his vanity... He was clothed in purple and fine linen... He loved parade and magnificence... but it was in an age when everything contributed to this passion, when Religion itself was clothed in the most gorgeous dress, and when piety was believed in a great measure to consist in a splendid temple and in the grandeur and show of outward ceremonies. He fared sumptuously every day continues the parable. But the Law of Moses to which he was subject insisted not upon the most rigid temperance. *A land flowing with milk and honey* was one of the first promises made to the seed of Abraham and one of their chief inducements to obedience. Nor do we find that this rich man is accused of having transgressed the Law in this point of having eaten of their food the Jewish Law giver has forbidden or broken this the rule of abstinence his Religion has commanded.—*He fared sumptuously.*—Yet we have no absolute authority to charge him with gluttony. We are not informed that drunkenness or profanity were practiced at his meals or that from one scene of debauchery he rushed to another—that he added avarice to his thirst for pleasure or that he dissipated among the more abandoned of mankind—that which ought to have afforded subsistence to the poor and helpless, that with which he was intrusted for very different purpose.

In fine he was not upbraided with impiety or want of religion. He was not called a cruel Master, an unfaithful husband, nor a treacherous friend. He is not said to have made use of his riches to corrupt the honesty of others, to seduce and ruin unguarded innocence... to vex or distress his neighbors, to baffle his schemes or disturb his measures. He was not envious nor revengeful. He lived well and easy such a life as is agreeable to the nature of those whom we call *Men of the World*, or life which compared with that of many amongst us was blameless, nay it might be said praiseworthy.

To this state of the questions you will no doubt approve his hard heartedness toward Lazarus, his want of feeling to the suffering of those beneath him... you will claim your own better title to the mercy and favour of God since you have ever attended to the lamentation of distress—You have bestowed much in charity. To this I answer such a conduct is not without its uses—but charity is of still more extensive nature... Unless you profess a *soul meek, gentle, patient, not vaunting itself not puffed up though you give half your goods to feed the poor* and tho you give your body to be burned: it profiteth nothing. Alone, giving is indeed a necessary duty but it does not include the whole system of Christian benevolence. However, let us inquire a little further into the crime of

this unfortunate tho rich man and perhaps we shall find ourselves scarcely less blameable.

There was a certain Beggar named Lazarus who was laid at his Gate full of sores and desiring to be fed with the crumbs which fell from the Rich Man's Table. Here is indeed a picture which must alarm and awaken the spirit of humanity, and must excite every tender affection of the soul to pity. The rich luxurious and sensual man seated at his table that overflows with delicacies insensible to the misery of a fellow creature who is reduced to beg for a few crumbs to soften the harshness of this hunger—this is indeed monstrous in the eyes of religion and charity. Nevertheless if we examine a little more closely, we shall find that our Lord does not represent the conduct of the rich man as any extraordinary and astonishing instance of barbarity but as the ordinary proceeding of persons in such a situation, the proceeding in short of a man careless easy and unreflecting.

Lazarus was a common Beggar and men are usually less touched with the wretchedness of these than with the want of those who petition in a less common manner. We are apt to persuade ourselves that their urgent petitions are only artifices to gain attention. In short, most of these considerations which are apt to render us deaf to the entreaties of the common beggars and wanderers that

appear about our doors might serve in like manner to make him *deny* the request of Lazarus and so far may serve in excuse for that want of common compassion of which we have perhaps no right to accuse him.

Lazarus "was laid at his Gate full of sores." Such an object tho it may draw a tear from the eyes of humanity is not equally successful in working on the feelings of all. Such an object laid daily at their Gate would offend the delicacy and provoke the indignation of some of the rich men of the present day. We do not find that the rich man in the parable expressed anything like indignation.

Nor are we even informed that Lazarus made a personal application to the rich man. He desired or wished *to be fed with* the crumbs. He perhaps was silent and left his affliction, his infirmities, his sores to plead for him... while the pursuits and engagements of the rich man did not allow him leisure to reflect on the misery of a poor beggar. And for this Abraham reproves him as one day or other all the thoughtless and inattentive sons of pleasure and dissipation will be reproved at the judgment seat of Christ. Lazarus was naked and you clothed him not, he was sick and you visited him not, he was enhungered and you administered not unto him. Son remember that thou in thy lifetime receivedst thy good things and likewise Lazarus evil things but now he is *comforted and thou art*

tormented.

They who have never tasted the bitter draught of adversity—they whose desires are gratified at a wish—they who say to their Souls eat, drink and be merry, there is much good laid up for thee for many years. They who live for themselves only who take no thought for the suffering of others—to *them* must the application of the parable under consideration be made... They have received their good things and have made them subject only to the gratification of their passions—they have had the foundation of their happiness upon earth. There they have built a city, there have they placed their utmost confidence.

Let us now take a different view of the subject and examine the situations of Lazarus and this rich man after death. Attend to the conclusion of the parable. It came to pass that the Beggar died—worn down with pain, sickness, and want, he sinks beneath the burden of calamity and is conveyed without pomp or solemnity to the silent grave. But mark the change. He was carried by the angels into Abraham's Bosom, to those Regions of Bliss, the final reward of virtue, fortitude and patience. There his tears are wiped away, his poverty enriched, his humility is glorified and his patience rewarded with eternal Happiness.

The rich man also died and was buried. Behold then every mark of ostentation and magnificence which can accompany that last sad solemnity. The whole city is in motion. His vast possessions are the theme of universal conversation, a train of affected mourners attend his remains and his Relations strive to eternalize his fame by pompous Titles and inscriptions engraven upon Brass and Marble. But all his glory must die with him—But tho he perished out of Land of the Living, tho his memory here be passed away and forgotten we find the rich man still miserably existing in another state. In Hell he lifted up his eyes and seeth Abraham afar off and Lazarus in his Bosom and he cried and said Father Abraham have mercy on me and send Lazarus that he may dip the tip of his finger in water and cool my tongue for I am tormented in this flame. Such an image is too dreadful to dwell upon and indeed I trust there are none amongst us so insensible as to require it to be heightened by anything I can add.

Let us therefore (once more) turn to the Object of this discourse, namely an enquiry into the chief cause of his condemnation. Tho this appears beyond all possibility of dispute no other than a life of indolence, thoughtlessness, and pleasure... a Life unmarked with great crimes but destitute also of Virtue. Now if such a punishment

awaited the disciple of Moses under a gross and carnal Law, can we Disciples of Christ under a Law, which is purity and holiness itself, hope to be more favorably received than the rich voluptuary under the Jewish Dispensation. We see that it is not enough to be easy harmless people not to do any wickedness but we must be actively good and pious, fruitful in good works, or like the rich man in the parable, or a tree bearing no fruit we shall be cut down and cast into the fire.

We are commanded to be *perfect* even as our Father who is in heaven and perfect. We have an example which we are bound to follow, our great and blessed Master. But is it imitating him my Brothers merely to do wrong to no man, merely not to commit adultery, murder, sacrilege? Are these the bounds of Christian Virtue? Was Christ content with doing wrong to no man? With paying tribute to Caesar, with not being accused of any flagrant sin? Certainly he was not. On the contrary, he subdued and mortified all earthly affections—prayed for his enemies, went about doing good, that is, made it his Business to search after objects of pity, to look out for opportunities of exerting his means of doing good—was not covetous or ambitious but was content and lowly of Heart.

To our blessed Saviour's bright and perfect example we should be always directing our view. His obedience, his

Holiness, his Meekness, his actual goodness are the copy which we should continually study; following nothing but as it conforms with him and esteeming him as the only pattern of our conduct—which if by the Grace of God we seriously endeavor to do, we may hope finally to obtain everlasting Life thru the death and mercy of our Lord and Saviour, Jesus Christ. To him be Glory forever.

Appendix B

Essays

1. Woodrow Wilson — 7 February 1924

Scarcely three months ago the American public paused a moment to hear its former leader, Woodrow Wilson, speak a few words on the anniversary of that momentous day on which peace again ruled on earth after five of the most terrible years in the entire history of the world. Perhaps the thousands who heard the voice of the great war president, brought close to their ears by radio, noticed its brokenness, a certain weariness, as that of a tired man. Perhaps a feeling of sympathy, of human kindness, warmed for a moment the hearts of even his greatest opponents. They may have felt that the man to whom they were listening was no longer the same powerful master who rose to the heights of the world crisis, and with a steady, unfailing hand led the United States through the perilous years of the war to an untarnished victory. Their feeling did not deceive them; the Woodrow Wilson who spoke on Armistice Day was a worn and disappointed man.

He had done his best; but even that seemed to have been misdirected and lost. His will was still strong; his

ideals, the determined pursuit of which had permitted him to accept first the veneration of the war-sick people of Europe, and then the scorn, the criticism, not only of Europe but of his own people without a faltering step, these ideals still guided him and directed him.

What, then, was it that transformed the war leader of this great American Commonwealth? His ideals had weathered every storm unchanged, his powerful mind and unswerving will had met and passed the greatest crises surely and confidently. He had never winced at the criticisms heaped upon him, nor evaded the cruelest attacks, but each had found its mark. Every unkind word, each unjust accusation had left a wound in his heart, a line on his careworn face. Finally, crushed by losing the support of his own people, the very ones he had striven for, his heart weakened and began to fail; the will was still there, the ideals were as lofty as ever, but the life, the human impulse, behind them was failing. He realized his repeated failures, must have understood that his aims were not those of his time, yet he struggled on till even that was impossible.

Thus, then, is the advance of the ages. A great man is seldom recognized as great until he has left this world. His virtues remain in oblivion until words of appreciation cannot reach his ears; his faults, his weaknesses outline

his character while he lives; he is misunderstood, scorned, condemned, until his faults begin to fade with the rush of time, and the rising light of truth reflects his greater, better self. America mourns for Woodrow Wilson outwardly today, she will mourn for him inwardly, in her true heart, in the years to come. Woodrow Wilson has left a mark that cannot be effaced: his voice still echoes in the halls of Paris and the streets of Rome, his hand is felt in the government of the United States, his writings are undying monuments to posterity, his ideals are helping to guide America to true greatness, and the world to peace. As the voice of the sad and weary leader was carried with the speed of light to the ears of the American nation, so the ideals for which he has given his life will be borne on the wings of time to the coming generation.

2. An Arm of the Ocean — 5 March 1924

A blue sky, a fresh wind, a steady keel; in warm sunshine, under straining sails, on foaming waters — alone on an arm of the ocean. Gently rocked by the majestic roll of the sea, now rising, now sinking, I rush onward, ever onward, landward. Reclining comfortably in the stern of my little dory, I gaze from horizon to horizon: behind me the boundless ocean, ahead the winding bay with its wooded shores. White-tipped waves splash musically at the bow, and softly break into foam as they pass. Now I am gliding through a narrow channel bordered with richly shaded evergreens. Here the tide runs stronger and the waves lash the great gray boulders that mark the shore. A pretty little bay passes where dark shadows linger and waver on the rippled surface. A great pine stands sentinel on a very gem of an island rising peaceful and green from a foaming fringe of brown and white.

Then, at my right, Goose River empties its dirty brown waters into the rich green of the ocean: the rhythmic roll ceases, the waters seem to boil, and the turbulent whirl of the current grips my little craft and tosses it about like an empty shell. The river forces it back, the wind urges it on. I rouse myself and sit erect. Headway has already been perceptibly reduced and the boat no longer responds to the rudder. Then the wind seems to gather

its forces, a ripple appears on the smooth waves in the distance, the sail swells and bulges, the mast bends and creaks, and with loud gurgling and flying spray I pass the eddying swirl.

A long, rocky promontory slips by, and I lean back again, content to enjoy the gently undulating motion of calmer waters. The wind no longer fans my cheek, it barely fills the sails, and the water is like glass. A gull soars overhead, scarcely moving; the silence is broken only by its shrill note which echoes through many little inlets. I have entered a veritable inland sea. It is bordered by green slopes and reflects the blue of the sky and the little white clouds that dot it. Far to my left in the deeper channel, the wind still blows over white-crested waves, but here all is still. I recline comfortably and bask in the August sun as I glide over the smooth surface marked only by the widening fan of ripples diverging from the bow. The shore slowly approaches and the rough, resinous bark of tree trunks becomes visible beneath clumps of trees. Here and there the white outline of a birch peers through the dark background, and far out on a bluff a scarlet maple raises its magnificent foliage. I pass between large brown rocks into shallow water, a gentle grating of the keel on smooth, vari-colored pebbles: the boat ceases its motion and leaves me beneath

nodding pines and hemlocks.

3. The Traffic Officer — 25 March 1924

The compact group of buildings which forms the little town of Waldoboro rises like a medieval village from the side of the hill. The only street, Main Street of course, crosses at right angles the great highway which winds like a black serpent along the wooded coast of Maine. Here farmers drive heavily laden carts into town from the peep of dawn to nightfall. Here tourists from the large cities of Massachusetts pass in prodigious numbers from early summer to late autumn. Here the dust-covered nag trudges wearily across the highway; here the high-powered motor car roars up the hill. Down the long slope it rushes, over the bridge, up the steep incline through Waldoboro, and up for another mile. Here the careless vacationer "steps on the gas" to "make it in high." Here the thoughtless, plodding farmer dreams his dream, but neither stops, nor looks, nor listens. And here stands the guardian of life, the Waldoboro Police Force — the traffic officer.

Like a bulwark of safety he rises from a pedestal of size twelve shoes. He is six feet tall, broad in proportion, and well "padded." His threadbare blue coat is dusty,

but it has brass buttons. It hangs almost to his knees which seem to sag a little under the bulk they must support. Firmly embedded on a short neck rests a heavy head; it nods occasionally and wags sideways as if tired of upholding that symbol of the law — the peaked cap. On his breast is the emblem of justice: a thrill of fear passes through the heart of every country youth, a gleam of pride appears in the eyes of each village father: from the polished nickel blazes that one word — constable.

Above this mighty director of the traffic is stretched an enormous red and yellow umbrella. It shelters him from the sun; it directs farmer and tourist to stop or go. The officer's eyes open occasionally when an impatient city driver blares out a threatening honk, honk. Then he shuffles his feet, grasps the handle firmer, and with loud groaning and creaking the umbrella turns. But generally he manipulates it quite mechanically; when a machine thunders up the slope, or a buggy clatters into town, the umbrella squeaks and turns its yellow side toward the oncoming vehicle. It passes and he sighs. His dreamy gaze is fixed for a long time on the yellow grocery store and the old white mare hitched to the post; then his eyes close, his head tilts to one side, his knees sink a little deeper — the officer of the law waits.

4. The Fire at Windsor, Nova Scotia, in 1898 — 1 April 1924

The town was a roaring furnace. The wind howled a hurricane; great flames quivered skyward; clouds of smoke darkened the sun. Buildings crashed to earth; trees hissed and crackled; chimneys crumbled and fell. Men shouted, women and children screamed; all was commotion. The withering heat and the thick, acrid smoke penetrated everywhere. Here a soot-covered man carried valuables from his home; there a frantic couple piled boxes and bags onto a wagon. Then burning cinders transformed them into heaps of flame which the wind sent flying through the streets. Horses neighing and stampeding, carts burning, people running for their lives, tears on their cheeks: so raged the great conflagration. From roof to roof destruction was carried, tongues of flame licked the wooden walls, glowing particles scattered fire everywhere. From house to house, from street to street rushed the relentless blaze; nothing was spared.

From the heart of the village rose the steeple of Christ Church: a plain wooden structure on a plot of green, a white fence with a neat little gate enclosing it. All about were buildings. There on the left was the Sunday School, to the right Wilson's grocery store, and there, too, was the parsonage. But the Rev. Thomas Maynard was not

at home; he had heard the alarm, he had seen the smoke and flame, he had gone to the House of the Lord confident that prayer would save his church.

The church was cool and still. A soft, mellow light filtered through colored windows onto the long aisle and wooden benches. The bronzed chandeliers hung low from the heavy oaken beams; the oil in the lamps was yellow, but the chimneys were clear and polished. Hassocks were carefully placed on the worn green carpet, hymn books neatly arranged in the wooden racks. A great old Bible lay open on the pulpit, a red bookmark hung from it. The rector in robes of office knelt before the altar, his head uplifted in prayer. At right and left were organ pipes, before him the crucifix. Not a breath stirred, here was peace.

Then the little door on the right opened, more violently than on Sundays. The old sexton hobbled toward the pulpit. His lean, wiry figure was bent, his breath came in gasps, his restless eyes gazed here and there like those of a hunted beast. He saw the rector and stopped abruptly. "Dr. Maynard," came from his quivering lips. The pastor rose and turned soft, gray eyes toward the sexton's agitated face. He said not a word, but the mild look which came from under long, white eyebrows asked a question.

"The town is burning, doctor; the Sunday School is on fire. Come quick. Save the Bible," shouted the trembling sexton, and his voice echoed from the carved roof.

An affectionate smile flitted over the rector's kindly face. "Leave the Bible with me, George," he said, "it is safe."

"You are going to stay?," the sexton stood aghast. "But the Sunday School is burning, the Sunday School is burning, if you..."; a crash outside. The bewildered sexton turned like a shot, then he limped away as fast as his legs would carry him. "Fire, Dr. Maynard, the Sunday School, the Sunday School," he shouted in confusion.

A sudden rush of smoke came through the door in which the sexton had disappeared, a tall figure was dimly outlined for a moment, an excited voice cried, "Dr. Maynard, for the sake of your wife and children, don't delay." The door closed with a bang.

Dr. Maynard stood motionless, he had raised his hand to his head; the pale, furrowed features looked haggard, but only for an instant. Then a strange, indescribable expression came into his face. It was confident, determined, gentle; but above all peaceful and calm. A heavenly light shone from his eyes. Unconsciously he looked up to the gable where smoke had gathered. His lips seemed to

move; then faintly, very faintly came the words, "The effectual, fervent prayer of a righteous man availeth much." He bowed his head, and went to the altar with firm step.

For long hours the bewildered, tearful people on the hill gazed at the impenetrable bank of smoke. Their homes were burning, scores were already in ashes. Then the wind abated for a moment, the smoke lifted, and there, amid blackened ruins, like a monument to God rose the steeple of the church. A cry echoed from the people and with one accord they ran between smouldering ruins toward it. The long roof of the church was black, it smoked in places; the little fence was a long pile of ashes, the Sunday School but a heap of ruins. The blackened door was open, and sharply outlined against the dark background stood the white figure of the rector. He scanned the remnants of his home, of his town; a tear was in his eye. "Thy will be done on earth as it is in heaven," he murmured, and turned back to his church. And the people followed him.

5. Culture: A Scientist's Ideal —
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For centuries men of letters, theologians and philosophers have thought and written in terms of those changing aspirations of an unfolding civilization that together form the history of the meaning of culture. For culture has had as many meanings as there have been minds that have speculated in a diversity of idealism so broad as to include both the crassest worldliness and the finest spirituality. Thus, on the one hand, the ideal of culture has been the glorification of man and the bold expression of all his hopes and wants; it has been the gratification of his senses, his quest for pleasure. Yet, on the other hand, culture has been the inspired exaltation of the supernatural and the sternest repression of desire; it has stood for the severest asceticism. Indeed, culture has ebbed and flowed like the ocean. It has whirled in the pleasure-bent eddies of hedonism; it has thundered the relentless dogma of religious fanatics; it has rippled gently in fresh breezes from Rousseau and Tolstoi; it has rested in limpid calm, reflecting Herder's vision of a higher nature and the intellectual freedom of Kant and of Fichte.

With the development of general education and the growth of scientific knowledge, the interpretation of cul-

ture became the province of the centers of learning. The German universities were founded upon the principle of academic freedom and critical inquiry an ideal of scholarship which, in stressing creative thought, was destined to dazzle the world with its contributions to knowledge. In Britain grew that great tradition, the "liberal education" of Oxford and Cambridge, with its emphasis, following Plato, on "learning, morals, and manners." But the war and its consequences have left Europe staggering intellectually as well as morally; and there have arisen philosophers of despair who speak not merely of economic crisis and social upheaval, but, more significantly, of complete cultural decay. Thus, while on the European continent education has become merely a stern training in nationalism, in America it might almost be called an "activities racket." Thomas Huxley, in defining a liberal education, demanded that youth be trained so that it could work with ease and pleasure. But is not the work often forgotten in a philosophy of "painless education" which strives to make life a Walt Disney rhapsody in sugar-coated pills? Does not youthful laughter often echo with a blustering and ignorant conceit characteristic of languishing intellectual integrity? In this same spirit of self-deception culture has been defined to be "what is left after you have forgotten what you learned." And in the measure

that dabbling aimlessly in many fields has become the approved process of learning, there is ever less and less to forget, and ever fewer find contentment in the mastery of even small things. In American colleges the liberal education of the English tradition and the scholarship of the German are often little else than travesties. Manners and morals are neglected, while learning is held synonymous with a graded superficiality that substitutes surveys and ready-made orientation for deeper knowledge. The ideal of general culture has, thus, degenerated into a peculiarly complacent pride in labeled mediocrity. Indeed, it has become like a swollen pie-crust that stretches a nicely browned and sugared surface over much hot air and a few berries lost in blue juice. Why bother about ideals when one can live? Why work when one can have fun? Can not the practical mind be free and happy without the smugness of book-knowledge, without airs of refinement, without the stamp of a liberal education? But even the self-styled man of culture, blind to a historic tradition of adventurous thought, demands an idle place in the scientific sun. And while despising vocations, the mob, the labor problem and all machinery, he seeks consolation in the words of Powys:

> *"The cultured mind approaches everything through the imagination already charged with the passionate responses of the great artists; so that what he sees is a fragment of Nature double-dyed so to speak, a reach a stretch of time's whirling tide, that carries upon its chance-tossed eddies the pattern of something transitory and eternal."*

While admiring the glitter of these mysterious words, those who are accustomed to view nature more intimately, more simply and less colored by wishful fancy see no whirling tide. For them the ocean of culture has ebbed to leave only brown mud-flats full of squirting clams and dotted with screeching gulls. White sails are furled; the clipper ships lie rotting. Will the tide ever run in again?

In seeking an answer to this question let us leave aside the passions of the great artists. Let us be impassionate and look at culture not only as a beautiful tradition, but as a hope of to-day for to-morrow. Perhaps, viewed more personally and more modestly, it need not be an impossible ideal; perhaps it can be more than a static state that old-fashioned people like to look back upon. True, it is difficult to forego that flourish of rhetoric, which to so many is the very essence of the idea of culture. And it may seem especially bitter to the artist actually to descend to earth to seek a tangible meaning for culture

in the simple statement, "Culture is the working of the ground in order to raise crops."

Thus to define culture in terms of its most primitive origins is suggestive of agriculture, where the ground to be worked is the fertile but dusty earth; where the crops are just plants selected for a single vulgar characteristic—usefulness; where the work is hard and dirty—plowing, harrowing, seeding. But culture did not grow from a double-dyed fragment of a wave-tossed nature; it grew first from learning the meaning of usefulness, from distinguishing between weeds and valuable crops. It developed with intelligent and purposeful tools; it prospered with a slowly and painfully acquired knowledge of how to select seed from the more vigorous of the most useful plants.

Floriculture resembles agriculture in that it, too, grows plants in the earth, works over them with spade and hoe. But its aim is not usefulness. It seeks through patient and intelligent labor to develop flowers that will bring a special delight to him who approaches them, breathes their fragrance—the delight that men call the experience of beauty. Perhaps this form of culture will evoke the passionate responses of great artists, but fundamentally it is still agriculture, still the same working of the ground for a purpose, the same deliberate and studied attempt to control environment and understand heredity in order

to find the satisfaction of greater usefulness, discover the joys of new beauty. And its success is not the result of indolent disinterest or careless superficiality, but of consistent learning from experience.

Self-culture is like agriculture and floriculture in ideal and in method, but it must work another ground with different tools and for a loftier purpose. In self-culture the ground is the conscious self with its environment of a living body and of the great physical world in which it moves. The crops are ideas charged with intrinsic worth; the work is the intelligent use and development of the tools of experience and knowledge; the method is that of science. The problem at hand is to examine the ground, this conscious self; to study the tools with which it may be worked; to think upon the crops, the ideas, which may be raised. Is scientific self-culture possible? To what extent can an individual control his environment, coordinate his inherited talents and qualities to formulate and achieve his own ideal of worth?

The Ground

Whatever culture has been or may yet be, the immediate soil in which it grows is human personality. But an introspective awareness and a consciously analytical con-

templation of self dawn only slowly upon the maturing human being. And what is eventually revealed in cognition is then inevitably and deeply colored by prejudice and habit. Thus, to venture to examine self first brings discovery and delight, then confused reluctance and increasing wonder. For across the threshold of the primary experience of self, of sense-perception, consciousness and cognition which unreels like a cinema upon happiness and pain, upon contentment and sorrow, is a startling and mysteriously complicated interplay of mental processes. There is memory which reenacts as upon a stage the nerve responses of the past. There is thought which combines and builds out of mere sensations stupendous edifices in abstraction. Such are beauty, truth and goodness: all patterns and sequences vaguely assembled by nerves stimulated by wave-trains originating in the physical world. Finally there is will, that seems to compel action according to an unknown scheme in a greater nature and which would yet offer conscious choice.

Surrounding and inseparably a part of this psychological world is a body composed of cells which grow and reproduce, which are strangely and powerfully linked with a dim past of untold ancestors. They are combined into a coordinated and integrated organism of complexly related, self-sustaining parts that are sensible to many and

varied stimuli. These, in turn, lead to reactions in the form of sensation, of motion, of action and, after much repetition, of habit.

This entire biological-psychological structure is imbedded in an external environment of a social and physical world. Thus there are other human beings—parents, teachers, friends and foes. From them are acquired by persistent imitation, habits and prejudices and mental pictures in that scheme of custom and tradition which is society. There is the vast panorama of nature, of animals, plants and the inorganic; there is light for the eye, heat for the body, sound for the ear. And there are composite, man-made things—toys, machines, instruments for performing a million tasks; there are books containing mysterious treasures for the imagination.

It seems obvious that the conscious self, including its environment, is not simple to fathom or to analyze; yet some understanding must precede any attempt to control. For control is merely the ability to predict. To be sure, the study of human personality has always been the wonder of philosophers and the object of much detailed study by innumerable writers, seeking to portray the essential characteristics of their fellow men. And the literature of many lands is replete with character studies often revealing extraordinary and uncanny insight into

human conduct as a problem of the coordination of an inherited nature with an uncontrolled and seemingly uncontrollable environment. Great as have been the contributions to the study of human nature of literary, historical and sacred writings, the information so presented is more interesting than it is exact; it is qualitative and general, rather than quantitatively specific. From it nothing may be predicted with certainty, for it attempts to give only a synthetic cross-section of types, not an analytical and functional study of individual personality as a part of a universe governed by natural law. It has been and continues to be the particular task of science to pursue such a study. And scientific advance has been nothing short of phenomenal in some fields; in others little more than a beginning has been made. Thus the physical-chemical sciences have probed deep into the properties of inanimate matter with signal success in predicting and controlling its behavior. The physiological and biological sciences have studied the characteristics of life processes, of evolution and of inheritance. While learning much that is of the most fundamental significance, they have as yet not penetrated into the mysteries of the auto-synthetic and auto-attractive properties of the ultimate particles of life, the genes. Psychologists, anthropologists and sociologists have struggled manfully with the

extremely complex psycho-physical make-up or personality of individuals and of groups. By many approaches they have sought to disclose some of the deeper secrets of consciousness and of mental processes. But their task is hardly begun. And each individual, interested in a practical scheme of living, finds even the most modern science able to contribute little more than an optimistic attitude instead of essential knowledge about mind and body as a functioning unit in a personality-moulding environment. Inevitably he senses that mankind is pathetically ignorant, and he wonders whether the whole idea of scientific self-culture is not premature, whether mysticism in one form or another is not to be preferred. For it is still extremely difficult for even a keen intellect to view himself as a part of a natural order subject to natural law. It seems reasonable enough for the physicist, the chemist, or even the geneticist to control certain forces of nature or at least predict their behavior from mathematical formulae. But to picture himself as consciously and deliberately planning his own road to what is worth while startles him, even frightens him into believing that there is greater hope and comfort in the passive faith of ignorance.

Tools

Each human personality, when it attains the maturity which finds interest in the problems of self-culture, is the product of a complicated sequence of interactions depending upon heredity and environment during those formative years over which the individual had no control whatever. What he does and thinks to-day is thus indeed the outcome of all his yesterdays. But is not that a key to the future? Personality does not change abruptly; but must not its development be deeply influenced by always seeing each to-day as a yesterday for to-morrow? Can it not be encouraged to grow more like wheat in straight furrows planted to-day, instead of like weeds scattered by the winds of habitless chance? The answer lies with the individual sensibility to experience and knowledge, with the tools of self-culture; and with the hand that must guide them, with intelligence.

The basis of experience is perception. This does not depend only upon immediate sensation, but also upon images in memory and, in particular, upon that mental activity which discriminates and recognizes. Thus, although it be not possible for an individual to predetermine his environment in any general sense, he can certainly deliberately set out to observe some things with

attention, to pass others by completely or superficially. He can not always select what he wishes to forget, and then forget it; but he may well choose what he will remember, and make that the food for his thoughts. And thinking, he may reject one subject in order to dwell more deeply on another. In this way he may exercise intelligent selection in the development of intellectual as well as physical habits and taste. Experience, in brief, is a tool which moulds personality. It has its special characteristics and, of course, its limitations. Like very other tool it can be used and misused. It can be handled expertly and with grace, or clumsily and without care. Each man must use it, whether he will or no. But only a few try to learn its secrets in an attempt to develop a technique for using it effectively in the practice of self-culture.

Knowledge is a special kind of experience. It is the history largely of other people's discoveries translated into the language of one's own thoughts. It is a master tool with which one may learn to use immediate experience to greater advantage. With it thoughts may be developed and guided; memory may be stocked; perception itself may be enlarged to include a new freedom acquired only through knowledge of natural law in the broadest sense. For when there is consonance between man's habits of thinking and willing and an observed consistency in na-

ture, the experience of freedom is boundless. It is the aim of science to achieve this freedom by discovering processes of thought which express the consistency or permanence actually observed in nature in a general and useful form. Hence, if the ideal of self-culture is still the old "Know thyself," its meaning may be made scientific. For to have formulated the laws of nature, is to have found the key to harmony in life and to the discovery of what is preeminently worth while.

Without intelligence experience is wasted and there can be no knowledge. A man's intelligence is a part of his inheritance; it is a link in the evolution of the human species. To possess intelligence is to be capable of learning to guide the tools of experience and knowledge in the interest of self-culture. Few habitually take advantage of this faculty to develop technique and to build new habits of skill; many let it wither and die.

To work the ground in self-culture is far more difficult than in agriculture, for the seeds of worth-while ideas have never been discovered. Fortunately, thanks to keen observers, a little is known about the conditions most favorable to their appearance as if from nowhere. And each individual can learn much about his own personality by careful observation and judicious experiment. The great mathematician, Poincaré, has given a formula for

his own case, and many a scientist has learned its value. Poincaré discovered that while new and significant ideas grew most readily when his mind had been deeply saturated with a subject, they ripened to maturity more often in the clear air of complete distraction. Thus, to work the ground truly is to study deeply, to use experience and knowledge with a maximum of skill. And then, when all may seem to have been in vain, to relax, to forcibly hurl consciousness into the refreshing environment of wholesome pleasure. Then, if the preparation has indeed been adequate, ideas may begin to appear as if by magic, thoughts gather, and the ecstasy of creation and discovery will fill the whole being with its dazzling light. Presently it will grow dim, and the time will have come for weeding and systematic cultivation. The new thoughts must be examined critically; they must be studied on the basis of experience, analyzed in the cold gleam of objective knowledge. What is unworthy may then be rejected; what seems truly worth-while must be retained, developed, allowed to take root and grow into new habits, for that is the ideal of self-culture. In the words of Goethe: "Eine schiefe eigene Meinung bringt der Erkenntnis naeher als eine uebernommene richtige."

In agriculture one seeks useful plants; in floriculture those characterized by beauty. In self-culture the purpose is to develop ideas charged with worth. But what is this usefulness? What is beauty? More particularly, what constitutes worth? These are all abstract and relative terms signifying certain groups of nerve-cell reactions characterized in a recognizable and distinctive way by each individual sensibility. Thus, there are experiences which produce the sensation called beauty; there are others that lead to that called usefulness; and both may be included in a single, more general group as characterizing two aspects of worth, meaning desirability. And what will or will not be so grouped depends in the last analysis on each personality. In general, however, there is wide-spread agreement on many experiences leading to individual sensations called beauty or usefulness. In agriculture, then, worth-while means useful; in floriculture it means beautiful; in self-culture, on the other hand, it seems convenient to distinguish four broad and overlapping sensation-groups which may be called the qualities of worth. They are, first, the essential quality of usefulness; second, the esthetic quality of beauty; third, the rational quality of truth; fourth, the moral quality of goodness.

Of these four qualities the first two, emphasizing things to be done or achieved, are essentially artistic in nature. They may be associated, respectively, with the practical and the fine arts. The last two qualities, on the other hand, concern themselves principally with method and with knowledge. They are thus scientific in nature, and are related, respectively, to the natural sciences, mathematics and logic in the first, and to ethical science in the second. To understand worth, then, as the characteristic ideal of self-culture, means to have broad experience in these four qualities. In themselves they critically encompass all human experience and knowledge; they suggest many fields as yet hardly touched.

The quality of usefulness is associated with practical things. In a restricted sense it means the fulfilment of essential wants which, in the modern picture, include food, clothing, shelter and comfort. But in a larger sense much of human civilization is an expression of usefulness. For its professions, trades and practical arts; its instruments of government and law, of education, of commerce and of industry are dedicated to the end of service. It is in this broad and comprehensive sense that usefulness is described as the essential quality of worth. It is the foundation of life in a society; it is prerequisite to physical and mental living. But usefulness is not synonymous

with worth; it is but one of its qualities. And that utilitarianism which would make utility the only significant characteristic of genuine worth is either still buried in the primitive past of a stone age, or it has descended to the insipid comfortism of to-day. What is useful to man and society must always be preeminently worth while, for it includes all that is related to the direct control of experience. But a broader vision of an enlightened self-culture will seek and find values transcending far that of usefulness alone in its plan of creative achievement.

The esthetic quality is derived from primitive responses to pleasure. But in an integrated and highly organized social structure with its problem of human relationship, pleasure is a complex experience associated not only with direct sensation, but also with cognitive sequences and coordinations. Beauty is, thus, an experience not only of physical pleasure, but more especially of emotional and intellectual enjoyment. Beauty in physical things, for example, is characterized by color, shape and proportion; beauty in literature depends upon style, diction and motivation; beauty in science involves simplicity of structure, clarity and coordinated symmetry; beauty in human relationships is associated with fairness, loyalty, unselfishness and cultivation. But always beauty is a personal discovery, and as such it is essentially rela-

tive. Its definition by an individual depends alike upon his refinement in sensibility and upon his breadth of experience; its perception is intimately related to his manner of approach, to his attitude toward problems of self and society. Just as there are modern utilitarians who dogmatically identify worth with utility, so there are the old aristocrats of culture that like to associate it exclusively with beauty. More significantly, culture from their point of view is not a conscious striving for a purpose, but rather a *fait accompli*, a static condition of conventional form in manner and of traditional point of view. Even as the utilitarian is emotionally in a stone age of food, clothing and shelter, so these white-collared gentlemen of etiquette are intellectually still in the Victorian age of *belles-lettres*. Beauty as a quality of worth must burst such corseted dogmatism if it is to lead in a modern quest for self-culture.

The experience of truth is the climax in the exercise of reason. It is a cognitive reaction so unique and characterized by an intellectual exhilaration so unmistakable that there is strong temptation on the part of those who know it well to elevate it to a favored place among the qualities of worth. In meaning, truth is not rigid and static, as many would have it; it is no unchanging principle of an eternal universe. But rather, it is relative,

like beauty; like usefulness it depends upon the time in history, upon circumstance and especially upon the sensibility of the individual who perceives it. For truth is continually being made and modified by experience. A new truth is accepted and an old one is rejected as a mistake if the cognitive processes are so better served. To be sure, it is at times pleasing and impressive to maintain that truth exists continuously though unknown, floating vaguely in an abstract universe as an absolute and unknowable ideal. But in the language of science such evidences of lofty desire serve no useful purpose; for each scientific observer, truth must be primarily the claim of a particular moment and place in his cognitive experience. And the personality of each individual unmistakably reveals itself in the postulates he sets up as true and in the evidence which he accepts as convincing test. The scientist attempts to establish the truth of a hypothesis by the systematic observation of its consequences in a planned and controlled experiment. The religious thinker, proceeding in a fundamentally similar method of also seeking verification for beliefs and doctrines, often depends upon experiences so deeply and unalterably colored by faith in the very postulates he seeks to verify that the test loses all meaning. Science, too, has faith, but it is not faith in postulates. It is faith in a method for defining

truth specifically in terms of directly observable consequences. Thus, by establishing a correspondence between abstract mathematical thought and direct experimental observation upon periodicity in natural phenomena, the mathematical-scientific method was developed as a means of defining truth in terms of a predictable consistency in nature. In this way qualitative understanding was augmented by quantitative knowledge; a vague and imaginative ideal of truth was elevated in science to a well-defined intellectual experience. In other fields of human activity the meaning of truth is still often associated with man's ignorance rather than with his knowledge, however limited that may be. Such an irrational worship of vagueness has nothing in common with truth as a fundamental rational quality of real worth, as a cognitive experience that reveals harmony and order in the mind's description of nature in the broadest and most inclusive sense.

The moral quality of goodness has not been illuminated by a development of ethical science comparable with the phenomenal advance in natural science. But, as in the case of truth, the meaning of goodness at any time and place depends upon its observed consequences as interpreted and accepted by each individual himself. Thus the mystic is inclined to seek evidence as to consequences in terms of personal intuition which he believes to be ei-

ther directly inspired by the supernatural or indirectly revealed in sacred writings and customs. The realist, on the other hand, establishes more worldly tests in the form of rational and practical codes of ethics built upon direct observation and adjusted more or less successfully to the needs and exigencies of the time and place. Finally, many another projects human ignorance into infinite spaces of thought, calls it God or Virtue, and worships it blindly or fearfully as the ideal of combined truth and goodness. For such a devout the very quest for self-culture must be heresy. Thus one is led to wonder with Malisoff, "whether the truer prayer occurs before a shrine or before a magnificent illumination of human intellect." As a quality of the ideal of worth, as a characteristic of the very purpose of self-culture, goodness must belong to the human intellect as the guiding inspiration of a yet undeveloped ethical science. As a recognized and valued experience it must join in synthesis and harmony the qualities of usefulness, beauty and truth. For what is truly worth-while must have a consistent meaning in the mind of each worker in self-culture. It must encompass his most valued experiences in memory, his loftiest ideals in imagination; and both must rise from the still small foundation of scientific knowledge. Worth, so qualified, is to characterize the crops of self-culture, those ideas grown in the soil of

consciousness by an intelligence guiding the tools of experience and knowledge.

The Ideal

In the furrows of the earth is written a meaning of culture that is as lofty in its idealism, as naive in its simple faith and as uncompromising in its tireless industry as science itself. It is a dynamic reality, not a static memory. It demands creative effort, not merely a languishing veneration of a beautiful past. It is measured not by the elegance of a man's language or attire, not by what he has forgotten or still remembers, not by passionate responses inspired by great artists, but by his own ambition, by his own attitude toward his to-morrow. It builds upon intelligence, upon the skill and experience of to-day and the wisdom and knowledge of yesterday a plan for enthusiastic, vigorous creation. Scientific self-culture is still a hope rather than a completely realized method, but as such it is a true guide for him who labors with facts against prejudices, who walks modestly but courageously and confidently toward high places. Culture is a quest for vision and understanding; it is planful living. Culture is the working of the ground in order to raise crops; it is the conditioning of the conscious self to understand and

to create what is worth while.

Let there be a regeneration of such an ideal of culture, and it will bring with it learning, morals and manners. For it is an ideal of self-respect and of planned achievement, that grows not on those broad vistas of sand swept by the changing whims of educational fancy, but in the fertile valleys of individual experience, in the deep channels of personal knowledge. Let those who would be cultured seek more than a shell of form; let them be inspired by the will and the intellectual freedom that grows from profound understanding and consummate skill; let them study the technique of planned living; let them seek what is truly worth while in all things as usefulness, as beauty, as truth and as goodness. Then they may thrill to the wonder of creation and discovery, and so become conscious partners in the unfolding of civilization. All culture ebbs and flows with self-culture. Over the mud of intellectual indolence and spouting superficiality must rise the relentless tide of scientific truth. Then, over deep blue waters the white sails of trained and enthusiastic intellects may strain before an ever-fresh wind from the Great Unknown.

Appendix C

Verses

1. The Girl in Green — March 1928

Unseen, the magic of the spheres,
My spirit came to free,
With gentle potion which endears
The fairy which is she.

Unveiled by songs of Ariel,
Her graces gently mold
A passion's dream ethereal,
That heart would e'er enfold.

To lose her cheerful greeting,
The wonder of her charm,
At every longed for meeting
Would sound a sad alarm.

Such brightness is her laughter;
Such sparkle in her eye;
That hope forever after
In gratitude doth sigh.

For her's an em'rald nature,
By sunshine so was blessed,
That radiant from her feature,
There gloweth life's own crest.

No envy of a haughty queen
Need touch her heart sincere,
More lovely far, this girl in green,
I see without a peer.

2. The Spell of Niagara — July 1928

I stood on the bank of the river,
On the brink of that thundering fall;
And eternally rushing the water,
Enticed with a magical call;

With echoes majestic, prolonged,
And the rumble of ceaseless flow,
Like harmonious chords of an organ,
The plea of Niagara below.

The blue of the sky had vanished,
In the glorious sparkle of spray;
And the whirl of the river that counted
The hours of an infinite day.

Enchanted by Sirens of wonder,
That attracted with magnets of foam
To this beautiful, beckoning pasture,
Where ever the spirit might roam;

I leaned on the railing before me,
To adore the incomparable sheen
That reflected a rainbow of color
In tears of the river's green.

My heart beat so slowly, so strangely,
That I shuddered in joy and in fear;
'Twas the urge of hypnotic power
That drew me and beckoned, come near.

Oh God of eternity's marvel,
Must I yield? Let the river enthrall?
Draw to its cool, heaving bosom
My life and its prayer, my all?

I paused and awaited an answer,
Revelation, and hope from above.
Then the green of the waters encircled
The image of her whom I love.

A frown on her features was smoothing
With a smile that enchanted her lips;
As her voice sang a song of a robin
That happily trills and skips.

The spell of the river has yielded
To the joy of her laughter and mien;
To the beauty of life resplendent in
Niagara's fairy in green.

3. Reflection in a Foreign Land — November 1928

Strange,
I never knew my native land
Until I left its winding shore,
I never felt its friendly hand
Until I longed to feel it more.

Thus, then,
I find 'tis true what's said,
We leave to long again for home;
But yet, to learn why strangers bled
For lands that were not ancient Rome.

America!
Farewell, forevermore, a day;
Since here upon a foreign soil
I learn to love and not to pray;
To sing all tunes, to laugh, to toil,

To live;
And not as any nation's son
Who sees one single flag unfurled,
A banner loved. But honor's gun,
Mistake it not for all the world!

4. To Physics — April 1930 [Air: America the Beautiful]

Oh world of relativity,
What formula defines
Thy orbit in eternity
Thy spectrum's cosmic lines?

Mechanical, Electrical,
This firmament of time;
For telescope and spectroscope
A quantized bit of rhyme.

Oh energy that oscillates
From ether's heav'nly spheres;
Electron current modulates,
Detects for human ears.

Mechanical, Electrical,
Eternal ebb and flow;
A photon's flight in waves of light,
From sunlight's golden glow.

Oh postulates and theory,
Hypothesis untold;
Experiment, philosophy,
That universe unfold.

Mechanical, Electrical,
Thus Physics builds its shrine;
A monument of Truth's ascent.
A glimpse of work divine.

5. To Mary — March 2004

I met a lovely lady
By the open door.
She helped me almost daily
Do many a needed chore.

We walked and talked together
About the wind and weather.
She drove me many a sunny mile
With a happy smile.

Then my heart began to beat
In the summer's heat.
Four times I asked the question,
Four times she chose reflection.

Then one day in the wood
She smiled, said yes for good.
So we lived, and loved together,
And hoped 't would be forever.