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Stepping Stones

Early Experiences

People often ask me about my early years, perhaps to answer questions about what led me from that time to my scientific career. Although I was not a child prodigy nor did I, nerd-like, spend countless hours concocting demonic potions, it does appear that many elements of my childhood were the stepping stones that led almost naturally in the direction of the laser.

My childhood in Denver, Colorado, was old-fashioned and traditional, complete with extended family and neighborhood friendships. During my grade school years, my parents Abe and Rose, my sister Estelle, and I lived in the center unit of a triplex owned by my maternal grandparents in an older side of town. My grandparents along with my mother's three sisters Bertha, Esther, and Dorothy lived in one of the end units. My mother's brother (uncle Dave), his wife Ada, cousins Phyllis and Louise lived in the unit on the other side.

As a child and young boy, I would describe myself as curious, adventure-some, and sometimes creative. I was markedly hyperactive and had a tremendous reserve of nervous energy. As with most hyperactive kids, I was skinny, some 10–15 pounds underweight.

My high energy level often transformed itself into restless, sometimes mischievous, and now and then downright exasperating behavior. There's no doubt in my mind that, had Ritalin been available then, I would have been a top candidate.

Prophetic Beginning

Early in my youth, I developed a “doubting Thomas” personality. I was not easily convinced when presented with “facts” unless I could get some kind of confirmation. Accordingly, I embarked on my first “science research” project when I was about three-and-a-half years old. Prophetically, it was an experiment with light—albeit *incoherent* light.

I told my mother that I didn’t think the refrigerator light was turning off when the door was closed. She, however, was satisfied that the light switch was functioning properly. In order to settle the matter, I crawled inside the refrigerator. My mother agreed to shut the door behind me. *I was right*—the switch was defective.

That episode didn’t exactly launch my career, but it was descriptive of my way of thinking that persisted through the years. In fact, as my story unfolds it will become apparent that my wary outlook invited me to question and challenge the status quo. I was motivated to explore further, when others were content to accept what seemed to be obvious.

Early Adventures

Although most youngsters are curious and adventuresome, I frequently pushed the envelope and probably got into more trouble than most.

When I was around four-and-a-half years old, during a delivery, the laundry man left his truck in the driveway with the motor running.¹ That active truck mesmerized me. I climbed in, explored the controls, and managed to get the transmission into reverse gear. I gave it some gas and rammed the truck onto the curb across the street before it came to a stop. I was quite shaken up but exhilarated by the adventure. Luckily, I didn’t hit anyone; the only casualty was a damaged truck.

A few years later, I became curious about the operation of the clothes wringer on our washing machine. I “experimented.” I held onto a shirt to see what would happen as it progressed into the rollers. I found the answer: before I knew it, my arm was stuck in the wringer up to my elbow. I panicked, but again I was lucky; the machine jammed and I escaped without real physical harm. It was another traumatic learning experience.

¹It was quite normal to have groceries, laundry, milk, and ice delivered to the house during that time period.

Looking back, I'm surprised that I escaped my dangerous exploits without broken bones.

Another interest: I had a fascinating curiosity with the magic of chemicals. To me, the array of cosmetics my aunts Bertha and Esther kept in my grandmother's bathroom next door was a chemical laboratory. When no one was around, I mixed a little bit of this with a little bit of that to see what would happen. I found out! My aunts became downright unfriendly.

Even on the rare occasion that I was blameless, I seemed to have a knack for getting into trouble. One day, while playing softball on the vacant lot next to my grandmother's house, I was up at bat. Without warning, a neighbor holding my two-year old sister in her arms came up behind me. As I swung backwards in preparation for an attempted hit, Estelle was struck in the forehead. I was blamed, and my grandmother took my bat and hid it.

Estelle survived fine without brain damage. I know this because in subsequent years, she consistently got better scores on IQ tests than I did, and she is plenty bright and sassy today.

Since I kept getting into hot water with my parents and older relatives, I was constantly being reprimanded and punished. I was certain my parents and family didn't understand me. I looked for a way to escape. One day it looked like the right opportunity had come.

The iceman—*there really was an iceman*—was delivering ice for my grandmother's icebox. I climbed into the back of his truck without him detecting me. Alas, as he proceeded down the street, into the next block, a neighbor spotted me in the back of the truck. My getaway was aborted.

Games and Books

As a boy, my friends and I played the usual games of that period. Without the benefit of computer games to challenge us, we devised our own entertainment. For example, there was "cops and robbers." We designed and made our own guns out of wood. The "ammunition" was a heavy-duty rubber band cut from an old automobile tire inner tube. The top of the band was secured with a clothespin, which, in turn, acted as the trigger. A hit from one of those "guns" was not pleasant. Of course, we also played with the more innocuous water pistols.

We also didn't have access to the array of exotic plastic toys of today. Instead, we became obsessed with creative ways to utilize tin cans such as "kick the can." I don't remember the rules, but the object was indeed to do just that. Naturally, I was more interested in a more dangerous version of the

pastime of dealing with the cans. My friends and I would put a lighted firecracker under an inverted empty soup can and then watch, as it soared 15 or 20 feet into the air. Since Frisbees hadn't been invented, we used the tops of coffee cans to play catch. I have a permanent scar on my forehead to remind me of that activity.

As a book reader my interests were narrowly directed toward adventure stories. I was fascinated with "The Adventures of Tom Sawyer" and "The Adventures of Huckleberry Finn." I must have read "The Merry Adventures of Robin Hood" as well as Zane Grey's "The Lone Star Ranger" five times or more. "Paul Bunyan" and "Gulliver's Travels" were also favorites in my personal library.

I read some of Edgar Allen Poe's works and remember being frightened of the dark for years after I read "The Murders in Rue Morgue." I kept imagining that the murderous orangutan from Poe's story was crawling through my window.

My father kept nagging me to read Jules Verne's "20,000 Leagues under the Sea" and I finally did. No doubt about it, the creative, futuristic mind of Verne was remarkable. But I was not nearly as enthralled by Verne's writing style as I was by the authors noted above.

I was captivated by Albert Payson Terhune's glorified adventure stories about collie dogs. I read every one of Terhune's books and became obsessed with the virtues of collies. Consequently, I couldn't have been more excited and happy than when my aunt Bertha presented me with a collie for my 11th birthday.

Princie was indeed a very special dog and a great companion. If dogs can have a personality, Princie had it. He completely lived up to the exalted pedestal Terhune carved out for collies in his books... and more.

School Antics

You have probably guessed by now that I may have had problems coping with the structure of a public school system. My restless and mischievous ways consistently got me into difficulty. I was either called down for "talking," or generally disrupting the class and I spent a lot of time in the corner, often with a dunce cap.

One day, my sixth grade teacher left the room briefly to confer with another teacher. She returned to find the class in wild disarray; we were throwing paper airplanes and generally having a great and loud time. My teacher had no trouble discerning that I was responsible for the uproar.

She said, “Well, there is one thing about Theodore, it doesn’t matter whether he’s working on a math problem or raising the roof—he *puts his whole heart and soul into it*.”

There was only one grade-school teacher, Mrs. Nettleton, who effectively channeled my restless misbehavior. Quite simply, she gave me special assignments. It worked; I never did get into trouble in Mrs. Nettleton’s class.

Obviously, the three “R’s” didn’t resonate with me: too much routine and memorization. I didn’t start to get interested in school until I encountered algebra and chemistry. I was mesmerized with the “magic” of chemical reactions and challenged by the “puzzles” to solve with equations.

My father had specific plans for my future. He was quite concerned and steered me in other directions when I became captivated with the chemical processes that I worked with at an after-high-school job. Becoming a chemist was not what he had in mind for my career. He wanted me to be trained in medical electronics.

Introduction to Electronics

My father Abe was a very inventive electrical engineer. During the major part of his professional career he worked for several divisions of the American Telephone and Telegraph Company (AT&T) including the Western Electric Company, the Mountain States Telephone Company (then US West and subsequently Qwest), and Bell Telephone Laboratories.

It was my father who introduced me to the world of technology, and he had a very profound and positive influence on my professional interests. My father always kept a small electronics laboratory either in the basement or the attic of our home wherever we lived. There he explored his many creative ideas.

Inspired by my father and his home laboratory, I started to pick up hobby books in the library. I remember one of those books, “Fun with Electricity,” very well. The book was filled with fascinating experimental projects. I devoured the book and built every project that was listed in it.

To me, my father’s home laboratory looked like a fun place to be. I was enchanted with the scientific gadgets that abounded there. One of these “gadgets” was a sophisticated measuring instrument called an oscilloscope. The heart of that instrument was a tiny tube that measured only one inch (2.5 centimeter) diagonally, similar to the picture tube in a TV set. The difference is that the oscilloscope tube is used to display pictures of an electronic signal instead of television programs.

I had just completed making a powerful electromagnet by following instructions from my “Fun With Electricity” book. I knew that the oscilloscope picture could be altered and distorted by bringing a magnet near it, so I tried the idea out using my new electromagnet. Sure enough, I was able to produce many interesting shapes on the tube. However, I did not take into account the fact that the shell of this primitive tube was made of a magnetic iron alloy. All of a sudden, the tube jumped out and rammed into my electromagnet. The tube was shattered.

My father was incensed when he discovered that his prize instrument had been broken. He couldn’t figure out what happened and I didn’t volunteer an explanation. He didn’t discover the truth until I owned up to him on his 90th birthday.

Despite this episode, using the equipment available in my father’s laboratory, I progressed on to more sophisticated projects like design of audio amplifiers and building primitive radios.

Abe’s Creative Ideas

In his home laboratory, my father invented a device later to be known as the automobile radio vibrator. This mechanism was able to convert the electrical potential of the 6-volt automobile storage battery through a transformer to the 180 volt direct current needed to operate vacuum tubes in car radios of the 1930s and 40s. In modern parlance, this may have been the first “DC-to-DC converter.”

His colleagues, who did not have the vision to appreciate the practicability of his device, discouraged him, and consequently my father chose not to pursue his invention. Not too long afterward, the Motorola Company re-invented his device and for some 20 years there was a vibrator, essentially like the one my father had invented, in every automobile radio.

Abe also developed an electronic stethoscope before anyone took the field of medical electronics seriously. Unfortunately, when he presented a working model of his stethoscope to a cardiologist, the response was “yes, I can hear more information coming through, but since I’m not trained for this I don’t know what to do with it.”

My father also came up with a number of advances in the design of audio sound systems before the term “hi-fi” came into being. In the midst of working on his amplifier experiments, he had on occasion wires strewn all over the living room floor. My mother had difficulty navigating through this maze and would often get her feet caught in the wires. Plainly irritated, he told

her, “I don’t know what your problem is, Princie has no difficulty getting through the wires without mishap.” In his later years, my father mellowed.

A large part of my father’s career was spent in the engineering department of the Mountain States Telephone Company in Denver, Colorado. There he designed and developed the first “dial-by-radio” system, a technological breakthrough. He demonstrated the practicality of his concept by setting up a successful microwave link between Los Alamos and Albuquerque, New Mexico. Interestingly, my father’s boss had predicted that my father’s idea wouldn’t work, that “you will not be able to get the ringing signal through.”

I learned some important lessons, and a picture was starting to develop in my head. Authority is not necessarily correct in its assessment of fresh new ideas. From the automobile vibrator experience, I learned that if you embark into the new and unknown, you might not get endorsement from your colleagues—even when you have a valid concept.

Abe’s Values

My father kept close tabs on me. He was tough and demanding, yet at the same time he was a warm loving father. I always had the feeling that in times of trouble he would come through. Whenever illness struck, he was right there. On one occasion, when I was but a baby, through his fast actions and knowledge of first aid, he saved my life.

Abe and I were very close. We would oft-times play chess together, and a special bond developed between us. We could spend hours discussing his inventive projects in some detail as well as electronics in general. In that sense, he was probably closer to me than to my sister, Estelle, who in turn was much closer and communicative with my mother.

There was very little communication between my mother and me (after our joint refrigerator experiment), except... when she was chasing me around the table screaming at me, “Stop behaving like a clown in class.” Unfortunately, my mother suffered from dementia at an early age and at 72 succumbed to Alzheimer’s disease.

Although my father didn’t take me to ball games, parades, zoos, and the like, my uncle Dave, my mother’s brother, did happily pick up that banner. I remember going to parades with my cousin Phyllis, the two of us sitting on my uncle’s shoulders so we could get a better view. Uncle Dave was a “big” man.

I most admired my father for his high-level of integrity and the way he dealt fairly with people. In his value system, possibly somewhat naive, his

view of science was purely altruistic. He believed its only purpose was to help mankind and make the world a better place to live.

Nollenberger Electric

When I was 12, I got an after-school job. I rode my bicycle to a farm 13 miles outside of Denver and signed on to pick strawberries. That lasted one day. There's nothing like the taste of freshly picked fruit right out of the ground; I ate too many strawberries. The next day I went to the farm across the way and picked raspberries. I netted a little more this time but concluded that berry picking was not going to work for me.

I changed direction and focused on the possibility of an "in-town" job. As I searched the Denver downtown area I noticed an electrical appliance repair shop. I approached the owner Mr. Nollenberger and applied for a job repairing appliances. He looked startled at what must have appeared to him a brazen suggestion. He thought a moment and said, "I need someone to help with cleanup, sweep the floor, etc. I'll pay you 25 cents an hour."

It was clear to me that Mr. Nollenberger wasn't about to believe that a 12-year old could be trusted with repair work. I accepted his offer. My thinking was that I would be able to convince him I could handle the repair work when he got to know me better.

I had learned enough in my father's home laboratory to know that I was, indeed, up to the job. I was able to worm my way into Nollenberger's trust, and he did allow me to do repair work on appliances and radios.² I worked at Nollenberger Electric after school and on Saturdays during the school year.

The following summer, Mr. Nollenberger took a job as an electrician in a defense plant. It was the beginning of World War II, a year before the fateful bombing of Pearl Harbor. He asked me and I agreed to run the repair shop on my own. I was 13. Unfortunately, a pay raise was not part of the deal.

The following year, buoyed by my career success, I found another job repairing electrical appliances in downtown Denver. There, I got my 40% pay increase, taking me to 35 cents per hour.

By the time I reached high school I had a pretty full schedule. I was taking clarinet lessons and joined the school band. During football season I went to school to report for band practice at seven in the morning. After school I went downtown to my job and came home for dinner. After dinner

²Helpful was the fact that I had memorized the RCA Vacuum Tube Handbook. If I'm motivated enough, I will memorize.

it was back downtown to the University of Colorado Extension, for a night course in radio theory. I would return home at eleven at night.

I completed three years at North High School in Denver. During the height of World War II, my father was transferred from his work in Denver to the Bell Telephone Laboratory in Murray Hill, New Jersey. We moved to nearby Morristown. The New Jersey high school that I attended required four years of English credits whereas Denver had demanded just three.

I had many other extra credits, but my new school principal was not willing to take these into consideration or my involuntary uprooting due to the ongoing war. As a result, I did not graduate high school. But I had more than enough credits to qualify for admittance to the University of Colorado and was able to pass their entrance exam. A high school diploma was not required for admission. Many years later, in November 2000, my old school in Denver awarded me an honorary high school degree.

More Electronics

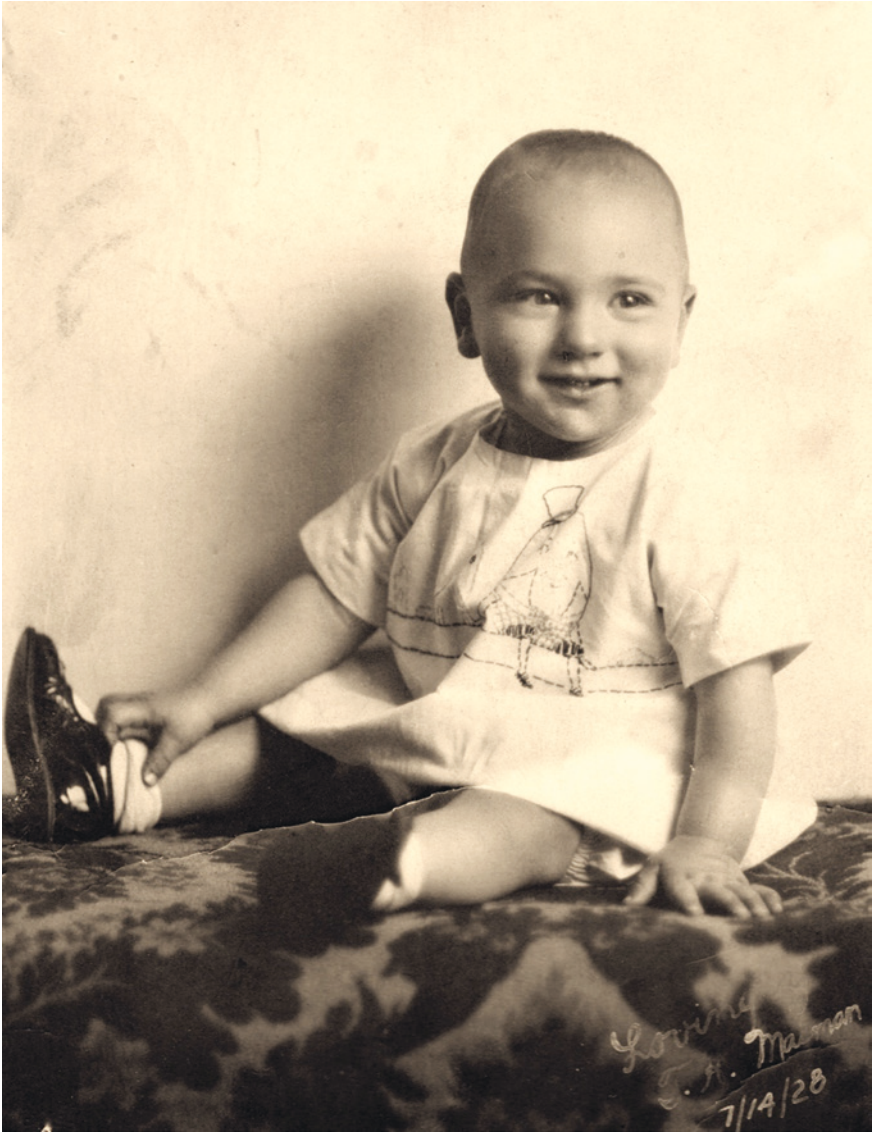
After moving to New Jersey, I secured a job at a transformer factory in Newark during school vacation. I was hired as a “utility boy.” My assignment was to move heavy transformers around the plant. I was now making 60 cents an hour. Moving transformers around was a pretty strenuous job. I applied for a transfer to work on wiring the transformer terminals. This was a much easier job and paid 90 cents per hour. But I was turned down with the reason: “That’s too advanced for a 16 year old.” Never mind that the task was trivial compared to the work I had done at Nollenberger Electric, but there was no persuading the wiring foreman.

At 17, after leaving high school, I got a job as a junior engineer at the National Union Radio Company, a vacuum tube manufacturing concern located in Nutley, New Jersey. This is where I first met and worked for G. Edward Hamilton. I designed test equipment for special military vacuum tubes under development and also spent time working on the design of voltage-regulated power supplies. As a result, with Ed I was a co-author of my first technical publication.

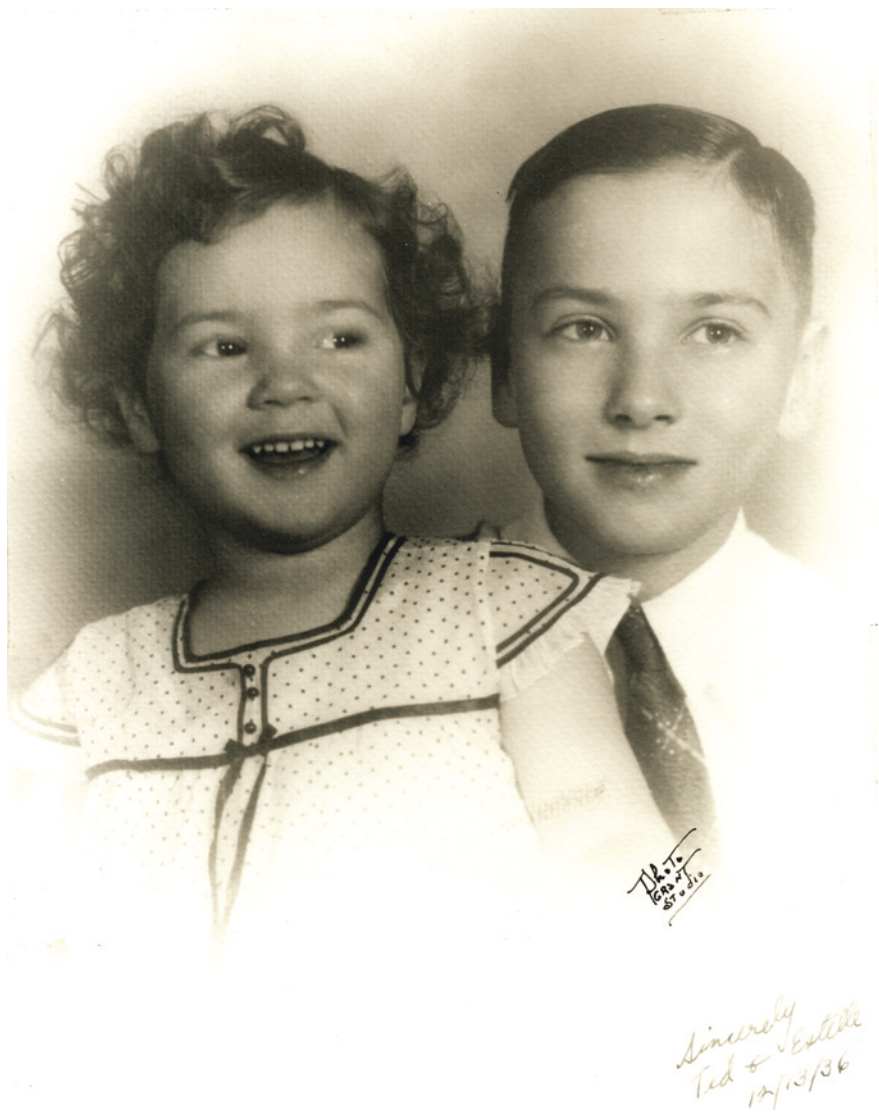
Ed Hamilton provided guidance to me and had a profound influence on my training and future career. He took the opposite attitude of supervisors I had encountered in my previous jobs, who had told me I was “too young and couldn’t possibly do that.” On the contrary, Ed delighted in giving me assignments that challenged my abilities. We became close personal friends for life.

At the same time that I worked for National Union Radio, I studied and passed the examination for a first-class commercial radio-telephone license. When I passed the examination, the license examiner told me that I was the youngest person in the United States to hold such a license. That license is the sole requirement for a position of technical responsibility at a commercial radio station.

In the latter part of my 17th year, I enlisted in the United States Navy. I was accepted into the radar and communications training program called The Captain Eddy Program. My naval radar experience furthered and strengthened my electronics knowledge.



Portrait photograph of Ted as a baby. ©Maiman Archive



Portrait photograph with Ted's sister Estelle, 1936. ©Maiman Archive



Portrait photograph with Ted's father Abe and mother Rose, before birth of sister Estelle. ©Maiman Archive

DENVER PUBLIC SCHOOLS
REPORT OF PROGRESS
ELEMENTARY SCHOOLS

Name Theodore Maiman

PART II

Marking Period	1	2	3
ARITHMETIC	1	3	2
GENERAL ART	3	3	3
MUSIC	2	1	1
ENGLISH EXPRESSION	3	2	2
READING	2	3	2
SOCIAL SCIENCE	3	3	3
SPELLING Words missed	750	770	21
Words given			470
School Days	28	30	34
Half Days Absent	10	4	0
Times Tardy	0	0	0

Assignment for next semester on back of card

EXPLANATION OF MARKS

1 Excellent	4 Lowest passing mark
2 Good	5 Failure
3 Average	

When the pupil returns to school after absence, a written statement giving the cause is required.
"Incomplete" will be written in the marking space when the child has not been present a sufficient length of time to receive marks.

Erben Doyle
Teacher

REMARKS: *Theodore has improved greatly. He hope he keeps on the right track from now on.*

PARENT'S SIGNATURE

First period *A. Maiman*

Second period *A. Maiman*

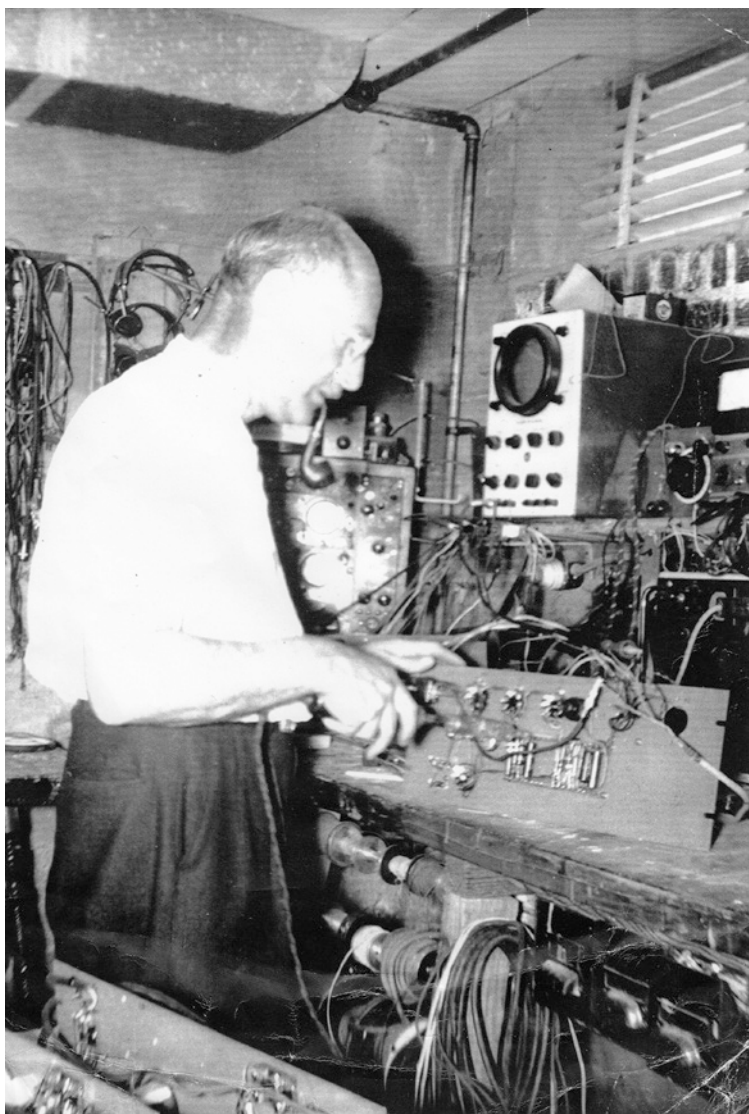
ASSIGNMENT FOR NEXT SEMESTER

To Grade *7 B*

Date *JAN 2 1933*
W. C. Butts
Principal

FORM 400-EP DSP 2-35-40M B-111-23176

Ted's school report card for grade 6—room for improvement! ©Maiman Archive



Ted's father Abe with electronics laboratory in home basement, similar to the labs he had with Ted as a boy. ©Maiman Archive



Portrait photograph of Ted in United States navy, 1945. ©Maiman Archive

<http://www.springer.com/978-3-319-61939-2>

The Laser Inventor

Memoirs of Theodore H. Maiman

Maiman, T.H.

2018, XXXIX, 312 p. 89 illus., 45 illus. in color.,

Hardcover

ISBN: 978-3-319-61939-2