WITH EYES ON THE STARS

How the Spirit of Chamberlin Observatory Inspired 1953 Student Custodian to Develop Apollo Simulator

BY

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MARCH 1997

REVIEW COPY

FOR THE UNIVERSITY OF DENVER,
CHAMBERLIN OBSERVATORY ARCHIVES
HENRY THE FIFTH

One of the guys Dick and I used to pal around with was Lowell Beatty (I'm not sure of the last name spelling.). He was a senior at D.U. majoring in theater. At that time a Dr. or Mr. Bell was associated with the Theater Department. Lowell told us how bright he was and that he read a book a day!

One of Lowell's final courses required him to find non-actors and have them act on stage in a skit from Shakespeare's Henry the Fifth. I volunteered and became Mortimer, the brave warrior who was in love with the Welch woman who couldn't speak English, nor I Welch. My roommate Francois also participated in Lowell's skit in some manner. Francois fell in like (or love), during the rehearsals, with my Welsh woman. This attraction between them was one-sided. They, however, remained friends.

This was fun and different from my usual routine of calculus and outer space. We actors-to-be, met Lowell several times in one of the empty classrooms for an evening of training and rehearsing. We learned "stage speech." You don't say mother with an "er." You say mother with "ah," like mothah, brothah, and fathah. We learned about listening loudly, about holding your hand and fingers correctly, about "upstaging," projecting voice, walking, jesters, and other stage actions. A great experience!

What I learned from Lowell I still apply today in public talks and in classroom teaching.
Lowell was intellectual, outward going, and fun to be with. I heard he died recently from AIDS.

Exhibit-18 shows someone helping me squeeze into the Shakespearian clothes. Lowell is standing in the background. Thanks Lowell!
STUDENT PARTIES

In 1953 student parties were different than today---no drugs! And student parties were not star parties. I'd never have a party in the Observatory. Lowell Beatty invited Dick and me to a party located in either a D.U. building basement or a student rooming house basement. Dick and I needed to get away from our studies and the Observatory once in a while.

We met Lowell at the party and he introduced us to several students, many majoring in theater. Lowell hoped we'd mingle and have fun. Music pored out of the record player and filled the basement for dancing. Snacks and drinks were available. Dick and I held back and watched Lowell and others dance and have a good time. We were reluctant to get acquainted with anyone. We just stayed together leaning against the wall talking and watching. Lowell pleaded, "Come on guys, get out there and dance."

"Sure Lowell, sure." We never did get out there. Not even together! We left the party as the "quiet astronomers."

Later, I was invited to a more private party in an apartment rented by two women students. There may have been four men and four women at this party. It was a nice social affair. We talked, joked, and sipped alcoholic beverages. After sipping a few glasses, I noticed one of the women sitting on my lap hugging me. The more I sipped,
the more she hugged! Maybe she was sipping too. To interrupt the attacker, I took time out and visited the bathroom. Noticing how dizzy I was, I steadied myself against the shower door and knocked down a pair of nylon stockings. In picking up the stockings, I noticed others draped over the shower wall. I touched the stockings gently while remembering my wife had hung her stockings in the same manner. I missed her.

Would we ever get back together?

I rejoined the party, sipped one more, and rushed back to the toilet to lose my stomach. This wasn't my idea of fun. I wasn't much of a drinker.

"Hal, drink this coffee," Lowell suggested. "It will help. And let's take a walk outside. The fresh air will do you good." We walked briskly around the block while I balanced my coffee cup—stopping occasionally for a couple of swallows.

"Lowell, please thank the people for me. I need to walk back to the Observatory. Take care—see ya later."

"Alright Hal."

As I approached the Observatory, I saw her patiently waiting for me. Moonlight glistened from her silver dome—my mistress welcomed me home!
A DATE WITH A PRETTY GIRL

She was a "soda jerk" who worked in a store with an old fashioned soda fountain---possibly a drug store. The store was located on the north-east corner of Evans Avenue and University Boulevard. I occasionally stopped there for a chocolate milk shake with cookies, and for a visit with the pretty girl. She was a young nice figured woman about 18 years old---shy, yet sociable.

After several shakes over a two month period, we got more acquainted and I asked her if she'd go to a movie with me. She said, "Yes." Well, what do you know, a real date! On date night I picked her up and we took the city bus to downtown Denver and attended a movie, whatever it was. We probably had refreshments following the movie and returned via Evans Avenue bus.

I walked her home from the bus stop and said good night at her door. I didn't kiss her, but thanked her for the splendid evening. I liked her, however, we never had another date. She seemed young for me---I wasn't ready to get serious.
TV CONSULTING

TV Station KBTV (Channel 9?) had a set designer and artist named Jim Gorden. Jim used to meet with us at a college hangout on Evans Avenue across from the University. We philosophized for many hours on various subjects. He occasionally visited Dick and me at the Observatory. One evening in 1953 he gave us a quick sketch of himself. (See Exhibit-19.) That same evening I asked him to sketch his version of a spaceship, including its overall shape and inside control room. (See Exhibits -20 and -21.)

Jim knew that I was working on a design for a two-person spacecraft simulator and he enjoyed my futuristic ideas. Because of this, he referred me to TV Station KBTV to be a consultant for their upcoming TV show on "Outer Space and Space Travel." I'm not sure of the actual show title.

A KBTV manager and his wife invited me to their house one evening for dinner. They asked personal and technical questions. Probably to check me out and learn something about astronomy, outer space, spacecraft, and space travel. Our evening discussion seemed to help them with their TV show, and I earned consultant credits. I watched the show, and sure enough, my name was listed with other names of people that contributed to the show. Thanks, Jim!
P.S. By the way Jim, I still owe you $90.00 for the loan you gave me in 1953 or 1954. The money was to help buy lumber for my spacecraft simulator project. It is now 1997—don't charge me interest. Thanks again.
EXHIBIT 19: Jim Gorden, A Self Sketch
EXHIBIT-21: A Future Moon Mission
Shirley Prout majored in theater and graduated in 1952 from D.U. We were introduced by Jim Gorden, a mutual friend. Shirley was a bright and enthusiastic person and about 24 or 25 years old. I heard she was a good actress. After getting acquainted, she told me, “Hal, I enjoy theater. It’s one way to help people, besides entertaining them. People can learn important lessons about life, and gain understanding of life’s tribulations and happy times. I, however, have found another avenue by which I can help people be successful.”

“What’s that, Shirley?”

“Well Hal, I went to Phoenix and got a certificate in Scientology to learn how to help people. That is, to make able people more able. And Hal, there's a scientific approach to it. A scientometer is used. It's an instrument for measuring a person's response to questions.”

“Oh, O.K. Shirley. How does it work?”

“Well, I'm called the Auditor, and the person I'm trying to help is called the Preclear. The Preclear holds an electrode in each hand which is wired to the scientometer. I monitor the instrument's pointer while asking the Preclear specific questions. Sometimes there
are large deflections of the pointer, and sometimes small or medium deflections. I try to correlate deflections to questions as guidance for constructing further questions."

"I see, you’re using a Wheatstone Bridge and measuring the resistance between hands. If a Preclear’s hands become sweaty, or if they squeeze the cans, the instrument’s pointer will deflect and indicate a different value on the scale."

"I don’t know how it works, Hal, but yes the pointer’s deflection changes. Would you help me practice, Hal? I need to get some experience. Besides, you may benefit as my guinea pig—I mean Preclear."

I thought about Shirley’s offer for a week or two and decided to give it a try. It couldn’t hurt. It could give me a new way to monitor a pilot’s control of a spacecraft, and possibly a way to control the spacecraft directly. After all, I was designing spacecraft controls and displays to increase mission success and crew safety. There’s nothing wrong with adding a few more instrumentation sensors to the pilots—it could save their lives.

Shirley lived with her parents in north Denver. I rode a bus across town and walked about a block to their house. It was dark when I arrived for our first practice session. As I entered the house, jazzed-up classical piano music was coming from the television set. The weekly Liberace show was on, and he was banging the piano smiling, smiling, and smiling.
“Hal, do you like baked potatoes?”

“Sure Shirley, I like baked potatoes.” And thinking, ah, free food.

“Come outside Hal. We’re burning trash tonight. We can bake potatoes in the burning trash. How’s that for an evening snack?”

“Great Shirely. I did that when I was a kid—they’re good!”

Denver had certain days when you were allowed to burn trash and this was my lucky day. Inside their thick black skins, the potatoes were delicious. Butter and pepper really topped them off. The black skins were not eaten.

After potatoes, we went into a den room. I lied on a cot with electrodes in hands and Shirley curled up in a chair with the meter, a note pad, and pencil. As far as sex goes, this was it! Me on the cot and her in the chair. There was no romance with us—we were friends only. She fired questions at me, and once during a long pause, I fell asleep. We had only one or two more practice sessions; then gradually got busy with our separate lives and saw less of each other.

These sessions with Shirley gave me the idea of monitoring space pilot’s brain waves during various types of tasks. This would make for interesting research in the simulator. Of course, there wouldn’t be g-forces and weightlessness, but we must start
somewhere.

I started collecting information on how lie-detectors and brain-wave machines function. The approach was to obtain data from sensors attached to the pilots. These data would be used to determine how well the pilots controlled the spacecraft. Data from both pilots would be fed into a computer which would compare and analyze the data to determine how well the pilots were doing. The computer could determine which pilot was the better pilot during performance of a given task. For example: If both pilots were controlling the spacecraft during re-entry into Earth’s atmosphere, the computer could determine which pilot was doing the better job, and disconnect control from the pilot not performing well. After landing, neither pilot would know who actually controlled the spacecraft—unless one died of a heart attack during re-entry! Of course, pilot performance could be monitored by the pilots and ground mission control personnel.

I enrolled in a lab course on, “D.C. Circuits and Machinery” at University of Colorado and needed transportation. Shirley let me borrow her car to drive to Boulder, Colorado a few Saturdays and attend lab classes. This involved a trip across town via city bus, a block walk to her house, pick up the car, and drive about 30 miles to Boulder. Thanks Shirley.

I lost track of Shirley in 1955. From the Alumni Relations department, I learned Shirley died in________________. Her husband—-

Thanks Shirley—not for dying, but for being a friend!

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INSPIRATION FROM OUTER SPACE

On the serious side, Chamberlin Observatory inspired me to accelerate design of a two-person spaceship simulator. Here I was, teaching the latest aircraft radar electronic systems for the USAF, studying calculus, designing a spacecraft simulator, and living at Chamberlin Observatory. At the Observatory I could study astronomy and astrophysics any time. On clear evenings I could aim the telescope and launch myself into outer space. I traveled carefully many times over the moon's lighted surface, looking for a place to land my spaceship. I darted in and out of Jupiter's moons and Saturn's rings. I searched for water on Mars, and watched for Flying Saucers landing and departing Venus.

By living in the Observatory and traveling through space, I transcended the material plane. The Spirit of Chamberlin Observatory and my spirit were one—infinite, immortal, and universal. This inspiration was a call to travel into a wilderness. The wilderness of outer space does have unknowns. How can we Earthlings travel safely in such an awe-inspiring environment? How can I help? I can do what I know and develop simulators for spacecraft.
GENERAL DOOLITTLE’S SUGGESTION

In April 1953 I wrote a letter to Jimmy Doolittle, the famous pilot and World War II General. I asked him if he knew any way I could work on the space program and prepare myself for contributing to the future of spaceflight. I wrote him because I met him and General Carl Spaatz (the four-star Head of the U.S. Air Force) at the Dallas, Texas, Fair Grounds in 1947. At that time I was demonstrating a four-engine flight simulator to the public. I was 17 years of age and this was my fourth simulator project. After giving the Generals a special demonstration, General Spaatz said, "Well, young man, some day I hope to see you in the Air Force." Pictures of this event were taken and an article was placed in a Dallas newspaper. (See Exhibits -22, -23 and -24.)

I enclosed pictures of the event with my letter. He returned the pictures with a letter suggesting patience. (See Exhibit-25 and notice the Observatory’s address under my name.)

I could not wait. I had to begin. The design had been developing in my mind since 1950. Besides there was a race to the moon going on and I wanted to be part of it.

Simulators were useful for research and for training. An early simulator would be a engineering research tool for developing futuristic controls and displays. The objective was to integrate human systems with machine systems in order to optimize success of
space missions. And then, with a training simulator, astronauts could practice flights to the moon, and especially learn to deal with various system malfunctions and contingency situations. Being inspired and ready, a spacecraft simulator was about to be born!
EXHIBIT 8: Hal Giving the Generals a Demonstration, 1947
Youngster’s Plane Panel At Fair Duplicates Work Of Four-Engined Aircraft

The Alamo is playing second fiddle these days to a four-engined airplane’s instrument panel board.

Hidden in the southeastern corner of Fair Park, adjoining the Texas Rangers Building, the replica of Texas’ Shrine of Liberty is being occupied during the State Fair by the Civil Air Patrol exhibit. And the most startling piece of ingenuity among all of the building’s aviation equipment is the work of a 27-year-old Dallas student who became interested in aviation through identifying engines of planes flying overhead.

Started At Nine.

Harold Secrist, Jr., at the age of 9 knew that aviation was his field. When he was 14, he put together the first of four instrument panels, using any old leftovers he could find. Now, at 17, he has assembled a panel out of strings, springs, wires, and a two-line electrical connection which utilizes 160 gadgets to the envy of any B-39 pilot.

Harold is a senior at Woodrow Wilson High School. Before his panel construction days, his grades averaged 95 with an accent on proficiency in science and mathematics. His history teacher called for a notebook Monday which he had not completed because of his interest in his aerial hobby.

“I told her that I had too many outside propositions but as soon as the Fair is over, she can look for an improvement,” Harold explained, adding that the excuse has not kept his marks from dropping 10 points or so.

Panel Is “Lifesize”.

His model instrument panel is “lifesize” and consumed nearly five months of “steady hobby time” in its construction. Viewed from the rear, it is a maze of 250 feet of string, 400 feet of wire, 70 springs, two pinball machine transformers and motors, alarm clock gears and even an electric train motor. The cost involved merely the time spent digging up junk parts.

The panel itself is made of plywood, flanked by abbreviated wings with de-icers and four propellers which used to be automobile fans. Navigation and landing lights flick off and on. They are also remnants of a pinball machine whose nickel-grabbing days are over. Landing gears came from boyhood structural sets. The whole contrivance is set in operation by turning on an ignition switch which once motivated an automobile.

Instruments on the panel include the altimeter, horizon readings, a compass, a tachometer to determine revolutions of the crankshaft and a synchroscope to make the engines jibe. The dial needles were whittled from wooden spoons. Harold seats himself before the board, with a co-pilot, and turns knobs which used to be radio dials and pinball obstacles. Through an elaborate hookup of strings and wires, he duplicates the works of a four-engined plane in flight.

Harold, whose father was stationed at Love Field with the Army during the war and decided to move his home from Niagara Falls, N. Y., to 5118 Rawlins St., in Oak Lawn, learned about airplanes and their panels from magazine diagrams and pictures.

Learned To Fly.

After he started work on the present panel, a successor to single-engine and twin-engine models of his own design, he began taking flying lessons and finally entered a real plane for the first time. With 13 hours flying time to his credit and three solo hops, he gave up what he considered a luxury so he could save his money for a college career, preferably at Massachusetts Institute of Technology, where he would like to major in Aeronautical engineering.

“I’d rather design planes than fly them,” he declared.

EXHIBIT-10: An Article From the Dallas Times Herald, 1947
April 30, 1953

Mr. Harold B. Secrist
2930 E. Warren Avenue
Denver, Colorado

Dear Mr. Secrist:

Have just returned to the office and find your letter of the 8th and Miss West's acknowledgement of the 16th. Thoroughly appreciate your problem but don't know how to advise you except possibly to suggest patience.

Recall very well the session at the State Fair in Texas and got a bang out of the pictures. Am returning them because I am sure you will want them for your files.

With every good wish and a hope that things work out as you desire, I am

Very sincerely,

J. H. DOOLITTLE

EXHIBIT-14: Letter From James H. Doolittle

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THE SPIRIT AT WORK

The Observatory was too small to build a full-size two-person spacecraft simulator. I had to move. Francois left the Observatory first and found a basement apartment with an empty garage. He rented the apartment from five nice young women that lived in the two-story house above the basement. The house was located on Cook Street north of Colfax Avenue. I rented the garage from the women for ten dollars per month.

The simulator will have to fit in this garage, I thought. Ed Mielkus, an Air Force friend of mine who also visited me at the Observatory, drew, from my specifications, an outline plan of the simulator in January 1954. From this drawing I built a scaled down balsa wood model. (See Exhibit-26.)

I was ready—almost. "Francois, there is no money for lumber except the $100 Jim Gorden gave," I sadly announced. My roommate was sympathetic.

"Maybe you can get a loan from the University Park Lumber Yard," he suggested. This problem was later solved when Francois went to the lumber yard and sold them on the idea of giving me a shipment of whatever I needed, free of charge. Thank you, Francois Longois, and thank you, University Park Lumber. (And I did thank them.) Evidence of construction is shown by Exhibits -27 thru -29.
A few months after starting construction, my wife and I got back together and found an apartment nearby. Francois moved to a less expensive place. My wife being pregnant with our first son, assisted me with simulator construction.

By this time I was a Radar Fire Control Systems Instructor at Lowry AFB. To expedite simulator construction, I invited my class of students to meet me at the garage to work on the "Rocket Ship" as they called it. They brought beer and I provided background music and supervision while they worked. At day's end, my wife treated them to a spaghetti dinner in our apartment. Thanks, everyone!

Other instructors at Lowry AFB (my peers) called me "Cosmo." I wonder where they got that name from?

Thank you, Chamberlin Observatory. Your spirit was working! You helped me:

- financially,
- socially,
- educationally, and
- inspirationally.

For the inspirational part, I have tried to summarize it in the poem, "Ode to Chamberlin Observatory."

And thank you D.U. for the free course on, "The Spirit of Chamberlin Observatory."

EXHIBIT 14: Early Construction of Garage Simulator, 1954
EXHIBIT-14: Hal Standing in Future Cockpit Area, 1954

HAL'S EPILOGUE

While still in the Air Force I continued to work on the spacecraft simulator, but needed help—money, information, and equipment. I was in the wrong place. The Air Force Training Command couldn't help me, although a captain at Lowry tried his best. He said I should have been on a research and development team at Wright Patterson AFB in Ohio.

Consulting didn't pay. For example: In 1955 while attending an advanced radar school in California, I was invited to evaluate Disneyland's "TWA Rocket Ship to the Moon" ride. Someone told them Cosmo was in town and they could get a free evaluation of their rocket ship ride. My wife, son Mark, and I went to Anaheim and received a book of free passes from Disney's public relations person, Tommy Walker. We took the trip to the moon and back without incident. We each received a Certificate for completing the trip. See mine in Exhibit-31. I evaluated the ride and told Mr. Walker that Disney needs to completely re-engineer the entire ride—band-aids would not work. He told me they didn't have the money, but will probably install a new ride in a few years. We thanked him for the tickets and left. I kept thinking, the ride was O.K.—any moon trip is great—besides I've got a Certificate!

I also worked part-time for a while at Denver Research Institute as an electronic technician, and at Hathaway Instrument Company in Denver as an instrumentation
technician. In November 1957 I was honorably discharged from the Air Force as an Instructor Supervisor. (1957 was also the year for the Earth's first man-made satellite, Sputnik.)

Know All Ye By These Presents:

that Hal Secrist

has rocketed round trip to the moon from the Disneyland Spaceport via TWA Rocket Ship and is hereby awarded this Lunar Flight Certificate.

The distance to the moon, 238,857 miles, is exceeded daily by TWA on its regular Earth flights across the U.S.A., Europe, Africa & Asia.

Disneyland, California

Date 1955 TWA Rocket Ship Captain

EXHIBIT-31: Hal's 1955 Trip to the Moon
In 1958, Dick Eastley helped me obtain a job working with him at The Martin Company. Our boss was Pat Pecht, Head of the Electronics Lab in Englewood, Colorado, just south of Denver. My title was Assistant Engineer, involved in trouble-shooting the Flight Controls System Checker for the Titan I missile—interesting work. Thanks Dick!

I later dismantled the Cook Street garage spacecraft simulator and built a fancy desk and bookcase which were used for college study while working on my degree at D.U. During this period I worked in the Systems Engineering Department at Martin-Marietta Corporation, on the Titan II weapon system. I completed courses required for a B.A. degree in Mathematics from D.U. and graduated June 1962. (See Exhibits -31 and -34.)

EXHIBIT-32: Hal Proud with Cap and Gown, 1962
I then landed a position with North American Aviation in Downey, California, to work on the Apollo Program—finally! They wanted an engineer with a mathematics degree and a simulation background. But what they got, besides that, was an inspired former Chamberlin Observatory "astronaut" with many spaceflight hours logged. I started in the summer of 1962 working in a Training Systems Equipment Group, and developed the methodology for selecting subsystem malfunctions for astronaut contingency training. Follow-on objectives were to ensure the Apollo Mission Simulator (AMS) had the capability to simulate selected malfunctions. This included simulating short and long-term spacecraft failure effects, including effects of crew action and inaction. The AMS was used for general training, for developing procedures, for solving engineering and operational problems, and was especially useful in assisting with the safe return of...
Apollo-13! Exhibit-34 depicts an artist's sketch of an AMS Complex and Exhibit-35 is a picture of an actual AMS installation.

Later I worked on two other space programs until 1970. One program included development of a mission simulator, where I was again involved with malfunction selection and failure effects simulation.

The lumber provided by University Park Lumber continued to be useful. The desk and bookcase had served their purpose in my den room as I worked on various space programs until 1971, when my wife and I divorced. (We had three boys. Today, Mark the oldest, is a pilot Captain for American Airlines flying MD-80s. Larry is an entrepreneur managing his own auto repair business in Honolulu, Hawaii. And Jay, the youngest, has his own carpenter business in Hawaii.)

I later married someone else, but had no additional children. Exhibit-36 is a recent photograph of myself and wife Dolly.

After the aerospace industry took a "dive" in 1969-1970, I developed a career in Quality as a Quality Engineer, Quality Assurance Engineer, and Quality Control Engineer.

In 1987 I returned to aerospace as a Division Auditor and then as a systems engineer on the Advanced Tactical Fighter for the Northrop Corporation, which later became Northrop-Grumman Corporation. I also worked as a systems engineer and as a project
engineer for this company on the B-2 Bomber until retirement.

I retired January 1, 1995, and have been teaching management part-time at Embry-Riddle Aeronautical University and at Park College in Barstow, California.

I joined the California Writer's Club and am writing, besides this book, a book that will become a "flashback" from this book. That is, a book telling the story of my life, experiences with simulation, and interest in spaceflight prior to my arrival at Chamberlin Observatory. The book will also contain my life experiences with simulation after leaving the Observatory, including development of the Apollo Mission Simulator. This second book will serve as a forerunner to a future book on global planning, which will have something to do with the future and a simulator for "flying" Spaceship Earth!
FORTY-TON TRAINER—Somewhere under all the protruding grey visual display generating devices sits an Apollo command module crew station for realistic training of Apollo flight crews. Television, motion picture and planetarium-type projection equipment provide training crewmen with out-the-window views of star fields, the moon and the Lunar Excursion Module. The consoles in the foreground from which simulated problems can be fed into the trainer are manned by instructors from the Flight Crew Support Division.

EXHIBIT 19: Apollo Mission Simulator, 1966
EXHIBIT 20: Hal and Wife Dolly in 1996
FOLLOW-ON CUSTODIANS

When I left the Observatory, Dick Eastley remained and soon invited Al Kouris to be his roommate. I knew Al. I met him months before and he used to visit us—a big friendly guy. Years later he wanted me to try golf. "There's a lot of physics with golf, Hal. You'd like it!" And also, years later, he'd offer a solution to my marriage problems. "Hal, someone has to be in charge. You must be in charge of the marriage." A great person. Thanks Al. After several months Al left the Observatory to marry Joanne.

About a month later Dick married Coralee, who moved in and helped with the chores. I had also met Coralee, then later Al's wife Joanne with their children. We were acquainted with each other. Appendix-C contains memories from Joanne and Coralee.
REFERENCES

The following documents and information sources can be used to learn about the Observatory, its history, and current events:

A. PUBLICATIONS

1. “A New History of Chamberlin Observatory” by William S. Kirby and Susan Stencel, 30 July 1993; University of Denver, Department of Physics and Astronomy. (This document contains many references.)

2. “Architectural Survey of Chamberlin Observatory” by Rod Wheaton AIA, June 10, 1995. (This document contains architectural and engineering construction descriptions, and includes drawings of the Observatory.)


4. “The Occasional Newsletter of Chamberlin Observatory” by the Friends of Chamberlin Observatory; c/o Department of Physics and Astronomy, University of Denver, Denver, CO 80208, USA.
B. INTERNET

1. For University of Denver Home Page, click www.du.edu

2. For a photo tour of Chamberlin Observatory, including history, click www.du.edu/physastron/chamberlin.html

3. For locating me, Harold (Hal) Secrist, click www.whowhere.com/. You will be able to search for my name and obtain my address and phone number. You can also E-mail me a message.

C. SCHEDULING VISITS

1. The Observatory is available for private and group observing sessions for up to 30 persons. There is a modest fee and arrangement is strictly by reservation. Call D.U. at (303) 871-3222.

2. For prerecorded information on Observatory activities, call the Denver Astronomical Society hotline at (303) 871-5172.
APPENDIX-A

BORROWED BOOKS RETURNED

The two documents found while dusting the library, I took to my room to read. One document related to my calculus study is titled, "The Law of the Mean and Taylor's Series in Computation." It was published in 1926 by Culver-Stockton College in Canton, Missouri. This was the college's quarterly publication which also included the 1926 Commencement Program on page 9. Page 10 contains special announcements concerning recent college activities. Page 9 and 10 were interesting and described how the college did it in the twenties. This document can now be found in the Chamberlin Observatory Library.

To design a spacecraft simulator, I thought I needed information contained in the second document titled, "The Luminiferous Ether: (I) Its Relation to the Electron and to a Universal Interstellar Medium: (II) Its Relation to the Atom." This is a small book of 55 pages and was published in 1919. The title page, page 5 containing a historical note, and page 55 are included in this appendix. Page 55, the last page, contains the author's final statement as to what makes up the "free ether" of outer space. The statement is a page long and the last sentence states, "This is an apparently simple statement, but without the discussion which precedes, it would be unintelligible." So if you want to understand page 55, you will have to read the whole book! It also, can now be found in the Observatory's library.
Occasional Scientific Papers
of the
Westwood Astrophysical Observatory
Number 2.

THE LUMINIFEROUS ETHER:
(I) ITS RELATION TO THE ELECTRON AND TO
A UNIVERSAL INTERSTELLAR MEDIUM;
(II) ITS RELATION TO THE ATOM

BY

FRANK W. VERY

Boston
The Four Seas Company
1919
HISTORICAL NOTE

This paper was presented in abstract at the twenty-second meeting of the American Astronomical Society at Harvard College Observatory, August 20, 1918, and is here reprinted in full from the New-Church Review for October, 1918 (Vol. XXV, pages 528 to 576). It is an elaboration of a view put forth in my critique and appreciation of Swedenborg's Principia which appeared in the same publication in April and July, 1913 (Vol. XX, pages 161 to 197, and 392 to 436), where a return to Swedenborg's scientific doctrine of a limited ether, and of light as consisting of discrete vibrating ether-particles, was advocated. The present paper includes much additional material, especially in respect to the connection of the ether with a fundamental electronic unit and the universal medium out of which both the electron and the ether-particle are supposed to be formed. Incidentally, further details are included from my papers an the cause and limitation of gravitation which have not, as yet, been published elsewhere.
from what they do. It is by the eye of reason that we must penetrate more deeply into the hidden recesses of nature.

Having now viewed our subject from various sides, we are in a position to say that, according to present light, the free ether consists of spherical elastic particles, while the electrons are cored vortices whose rigid surfaces are everywhere rotating with the velocity of light; that the ether, in so far as it is atmospheric, appears to consist not so much of a single atmosphere, but rather of innumerable condensations of the universal atmosphere around the electrons from which it is thrown off in radiant emission; that the ether penetrates the structure of all material forms, but with diverse degrees of freedom according to electrical properties, and is everywhere closely associated with matter, sharing with the electrons in a gravitative pulsatory motion of its individual particles by which both are continually connected with the source of their sustenance in the universal aura, and having besides, when free, a peculiar oscillatory motion of its own; that in this way the tiny electrons are most intimately conjoined with the vast galactic spirals and like them endure for ages, while the light of the stars, though dimmed, is not extinguished after traveling for millions of years; but as light-bearer, the ether is not an atmosphere, but an emanation of discrete particles, images of vibrating electrons, involving in their inception least quanta of energy, formed out of the electronic or intra-atomic "atmospheres," and possessing innumerable varieties of specific vibrant form which reflect the electronic motions at epochal moments of perturbation and inversion, and which are accompanied by electromagnetic fields of force in the universal aura. These extended fields interpenetrate and sometimes interfere. This is an apparently simple statement, but without the discussion which precedes, it would be unintelligible.

WESTWOOD ASTROPHYSICAL OBSERVATORY,
Westwood, Massachusetts,
May 27, 1918.
Astronomy and Astro-Physics.

VOL. XIII, No. 9. NOVEMBER, 1894 WHOLE No. 129

General Astronomy

THE 20-INCH EQUATORIAL OF THE CHAMBERLIN OBSERVATORY. H. A. HOWE, DIRECTOR

The work of mounting the 20-inch equatorial of the Chamberlin Observatory was begun in July, and the instrument is now in fair shape for use. The fact that the writer was able to get the instrument together without mistakes, and without the help of any skilled mechanics, speaks well for the care which was exercised in fitting and marking every piece in the shop. As this is the first large mounting of Mr. Saegmuller’s construction, which has been set up in this country, astronomers will be interested to know about its peculiarities, together with the excellencies and the faults (if any) of its construction. First, however, for the object-glass:

THE OBJECTIVE.— The discs for this were obtained of Feil and were figured by Alvan G. Clark. They are well-nigh perfect specimens of optical glass: the crown lens is free from striae, and the writer could find only three or four small ones in the flint lens. No polarization was shown by the ordinary test by reflected light, using a Nicol’s prism. There is but one noteworthy bubble which is a millimeter and a half in diameter. The color-correction is better than the writer expected with so large a glass of the usual type, and the defining power is exquisite.

GENERAL DESCRIPTION OF THE MOUNTING.— The pier on which the instrument stands is built of tough sandstone, being faced with dimension-stone, and filled with heavy rubble work. Its foundation is grout. The pier is 16 ft. square at the base, 12 ft. square at the top, and 25 ft. High, its base being below the surface. Into this pier are let three steel bolts, 9 ft. Long and 3 inches in diameter. Their heads lock into horizontal foot-plates 2 ft. square, imbedded 7 ft. deep in the masonry. On top of the pier lie three similar plates, through which the bolts run, and to which they are held by very heavy nuts. On these bolts is supported the 7000 lb. casting (shown in cut), which formed the lowest section of the pillar, its top being nearly flush with the floor of the dome room. The adjustment of the instrument in latitude is made by lifting the entire column by means of the adjusting nuts on the north bolt.
Upon this massive tripod stands a bell-shaped casting 5 ft. in diameter at the base and about 5 ft. high, to which is fastened by bolts running through internal flanges a second casting, on which in turn stands the square clock case. The adjustment in azimuth is beneath the floor, the bell-shaped casting being rotated by three pairs of opposing adjusting screws. The clock box can be shifted in azimuth (without adjusting screws) and is held in place by four set screws inside the pillar. The headstock is of a peculiar form, and projects far to the south of the pillar, so that the center of gravity of everything above the clock-case is well in toward the geometrical axis of the pillar. The weight of the entire instrument is 25,000 lbs.

**ANTI-FRICTION DEVICES.** The polar axis is a fine piece of Midvale steel resting in phosphor bronze bearings. The friction at the upper bearing is relieved by a set of six hardened steel rollers, each a foot in diameter and a quarter of an inch thick, which stand vertically side by side on the same axis. This axis is supported in an anti-friction bearing composed of small hardened steel cylinders. The system of rollers is nearly under the center of gravity of the moving portion of the instrument, and is pressed upward by a powerful bar spring inside of the headstock. Any desired tension is put upon the spring by means of a worm-gear, and the polar axis may thus be lifted entirely off its upper bearing.

The comparatively slight tendency of the lower end of the polar axis to rise is counteracted by a friction roller placed above it. The end thrust of this axis is small and is taken by a ball bearing at the lower end of it.

The declination axis runs in plain bearings, but the end thrust is taken by a ball-bearing at each extremity of the axis. The ball-bearing at the small end of the axis is adjustable and firmly secured by a set screw. A practical advantage of having plain bearings on the declination axis is that when the instrument is near the meridian, so that there is very little pressure on the ball-bearings, the friction is sufficient to keep the instrument from rotating when the micrometer is put on or taken off. Thus no manipulation of the counterpoises is necessary. The large screw on which the counterpoises for declination are strung is not a continuation of the axis, but of the sleeve.

**DRIVING CLOCK.** The driving clock has a Young’s double conical pendulum, the friction shoes of which are shod with vegetable fibre. The vertical spindle which carries the pendulum, carries also near its lower end a horizontal wheel, on the lower face of which are set two diametrically opposite armatures, which revolve over opposite pairs of helices, for electric control. The pendulum makes two revolutions in a sidereal second, and the helices are supposed to quicken or to retard its motion, as may be necessary. The clock train carries a chronograph which may be used either for regulating it, or for ordinary noting of time. The clock may be started, stopped, or wound from the floor, and runs so admirably that an electric control seems almost a superfluity. An electric motor for winding the clock is in contemplation. In winter heated air from a room below rises inside the pillar, and keeps the clock warm by day and by night.

**MAIN CIRCLES.** Each vernier of the hour circle is read from the floor by a reading telescope near the dial box on the south face of the pillar; the smallest reading is one second, but half a second may easily be estimated.
The verniers of the declination circle are read from the eye-end by two telescopes, the smallest reading being 5 seconds of arc. The divisions on both circles are exceedingly satisfactory in point of sharpness and distinctness.

**SETTING CIRCLES.** The observer, when on the floor, sets the instrument to any desired right ascension and declination by turning the hand-wheels on the south side of the pillar, and reading the two dials contained in the large cylindrical box, which is above them, on a level with the eye. Each dial hand moves at double the angular speed of the corresponding axis. The declination dial is figured from 0 degrees to 90 degrees each way, the smallest space being 1 degree. The right ascension dial has five-minute spaces, and is driven by an eight-day clock. Notwithstanding the large number of gears involved in driving this mechanism, the total backlash is so small that a star of known coordinates is brought back near the center of the finder at once.

It is important to have another system of setting circles visible from the eye end when the observer is on the north side of the pillar. This system consists of a 4 ft. circle on the declination sleeve which is read by the naked eye of the observer at the eyepiece to the nearest quarter of a degree with entire ease, and a 3 ft. circle on the north side of the clock box, which is similarly read to the nearest minute of hour-angle.

**ILLUMINATION.** As the entire building is lighted by alternating current at a pressure of 50 volts, this current has been utilized for the two-candle power lamps, which illuminate the verniers of the main declination circle, the large setting circles, the micrometer, the hand lamp, etc. The main hour circle is lit up by two lamps of 16-candle power each, which are so placed that they light up the dials south of the pier as well. As the voltage of the house current is too high for the small lamps, it is run through a special converter made by Mr. E. G. Richardson, of Denver, and presented by him to the Observatory. The converter carries a switch by which the voltage of the secondary current is made to suit the small lamps, which are arranged in parallel, and are thus as easy to control as the house lamps. The light is steady, and there are no batteries to require attention. This method of illumination is so eminently satisfactory that it is urgently recommended to all Observatories which have access to an alternating current.

The converter is inside of the pillar, about 4 feet above the floor, and is reached through a large opening on the north side of the pillar. The secondary wires run up from the converter through the clock case, thence out of a hole in the nose of the headstock, up through the polar axis (which is hollow) into the declination sleeve, emerging at the inner end of the sleeve, and being there attached to a series of concentric rings.

Springs fastened to the telescope tube, and pressing against these rings, lead the current to all required points on the tube. All switches are placed just where they ought to be, and the writer expects great satisfaction from the completeness and easy manipulation of the electric lighting.

**THE EYE-END.** To the end of the main sheet steel portion of the tube is attached a short cylindrical casting upon which rotates a spectroscope jacket, similar to that on the Lick telescope. In order to adapt the tube to photography, the entire eye-end has been made to slide upwards a distance of about 3 feet, being guided by four steel rods, which run in eight guiding lugs within the casting which supports the spectroscope jacket. For visual work this sliding piece is pulled out as far as possible, and for photography it is thrust clear home, so that the photographic focus lies outside of it.
In either position the sliding rods are held by clamp screws. At the lower end of the sliding piece is attached by a bayonet joint the tail-piece proper, consisting of the focusing tubes. The tail-piece has lateral adjusting screws, so that the sight line may be made perpendicular to the declination axis. There is but one finder, of five inches aperture.

**MICROMETER.**--- This attachment varies in some particulars from the ordinary American form. The verniers and the pinion for rotation in position angle are fixed, while the position circle revolves. Thus the observer can always find the pinion and the verniers, without loss of time. The circle which is 9 inches in diameter is divided to each tenth of a degree, and can be read by the verniers to hundredths if desired. Parallel to the movable micrometer wire is a system of wires, spaced at distances of 5 minutes of arc, for facilitating observations of comets or asteroids. There is but one fault to be found with the micrometer, namely that in certain positions the ends of the box are over the verniers, making them inconvenient to read. It is only just to the maker to state that he has promised to remedy this defect, together with any others which the observer may discover, after using it awhile.

**ADAPTATION TO PHOTOGRAPHY.**--- The crown lens of the objective is reversible, the two lenses being then separated by several inches. To accomplish this the telescope is pointed to the nadir, and the lower end of the tube is fastened to the pillar by a simple device. A reversing carriage is then run under the objective, so that the crown cell, which weighs about 150 lbs. is safely taken off, turned over and put back. When one wishes to photograph, the 5-inch finder and the entire system of handles for clamping and executing slow motions in right ascension and declination are slid up the side of the tube so as to be out of the way of the photographer though still usable. The tail-piece is then removed, and the plate-holder attached in its place by a bayonet joint. The plate-holder is movable in both right ascension and declination by five screws, the back lash being controlled by powerful springs.

For “following” there is a photographic finder, the objective of which is 5 inches in aperture, and is mounted on the outside of the main telescope, close by the 20-inch glass. The eye-end of the photographic finder is a small micrometer, which is attached to the plate-holder by a sliding mechanism, which allows the micrometer to be moved quite a distance in right ascension or declination or both, till a star suitable for “following” is found, and placed at the intersection of the spider webs. It is hoped that the displacement of the image on the photographic plate by changes of refraction, differential flexure of the tube, etc., will be practically the same as the displacement of the star which is used for “following.” If there is any twisting of the plate about the line of collimation as an axis, it may be possible to detect it by turning the position-circle of the micrometer so that one of the spider webs shall bisect two stars at opposite sides of the field of view. No mechanism has been provided for correcting such a twist, but should the twist be discovered, it will be easy to attach the plate-holder to the rotating spectroscope-jacket, the motion of which is controlled by a worm.

**RIGIDITY.**--- As it is well known that Mr. Saegmuller strives to build his instruments as light as is consistent with proper strength, some astronomers have feared that a large telescope of his construction might lack rigidity. This mounting is not open to such a charge, and must be considered as reflecting great credit upon its maker.
THE OBSERVING CHAIR.--- This is a 13 ft. high, six and one-half feet wide and 9 ft. deep. The platform (4 ft. by 3) slides up and down on four heavy trunk rollers, and is supported by a three-quarter inch Manila rope which takes a turn and a half around a six-inch oak drum; it is so counterbalanced as to require only the pressure of one finger to raise it. If two or three heavy persons are to be on the platform at once, an extra turn of the rope around the drum gives security against sliding downward. The chair is mounted on four of Martin's truck casters, which are equipped with anti-friction wheels, so that they rotate about their vertical spindles easily. A ring of iron concentric with the top of the wall of the room, and 3 ft. less in diameter keeps the chair from running against the electric lights, etc., on the wall. The chair works very satisfactory.

UNIVERSITY PARK, Colo.
APPENDIX-C

JOANNE’S AND CORALEE’S MEMORIES

Joanne’s Memories

Evangelos (Al) Kouris was born in Greece in 1926 and came to the USA when he was ten. He was an American citizen at birth because his father had served in the United States Army during World War I.

Al entered the mechanical engineering program at the University of Denver under the GI Bill in September 1953. Al had a GED, but lacked a basic math entrance requirement. Since universities were flooded with GI Bill applicants at that time, Dean Knudson, head of the Department of Engineering, could easily have rejected Al’s application. On registration day, I was leaning over the balcony rail of the running track of the old field houses to watch Al talk to Dean Knudson. After an hour, Al convinced the Dean he could handle an advanced algebra course at night while taking the regular freshman engineering curriculum. Al was goal-centered, and his determination brought him through.

To keep a budget, Al moved into the Observatory with Dick Eastley as a roommate in March 1954, and stayed through August. They both had inquiring minds and strong side interests in music and theater.

Al and I had wedding plans for August 28 in Buffalo, New York, my hometown. In June 1954, I graduated from the University of Denver Graduate School of Social Work.

I had a German Taunus (compact car) which I had brought back from Germany. It was parked frequently at the Observatory because it was our joint transportation. Al and I met each other in Augsburg, Germany in 1949. He was a sergeant in the 2nd Constabulary, and I worked for the United States Army in Special Services.

Accommodations at the Observatory were basic. The upstairs apartment on the west side was hot during spring and summer. The old wide floor planks showed their age and there was no rug. But Al and Dick updated their abode a little. They had a hot plate upstairs to brew their coffee. They also rigged up a shower, by dumping buckets of water over each other while standing in a large galvanized tub. They dumped the water out the window. Look out below!
Dick Eastley had a pet white rabbit in the apartment at that time. The rabbit needed cooler air also, so they brought the cage outside sometimes. There were a couple of fast and furious bunny chases in the Park. The bunny also escaped from its cage in the apartment a couple of times.

Al's future mother-in-law wanted to make a good impression on Al, so she made him a handsome light-weight wool bathrobe. She was not an experienced seamstress, so this was a big undertaking. The maroon robe arrived in beautiful style. Sometime later during a night study session, Al must have put some morning toast or some other goodies in the pocket of the robe. Because one day when the guys were out, Mr. Rabbit also got out. Yes, he sniffed around for any morsels and he chewed right through the new wool robe to find his treats. "Wow, how will I explain this to my mother-in-law?"

Al and Dick certainly respected Dr. Recht and admired his knowledge of the starry universe. They audited some of his classes and attended the public star gazing sessions. I took a Continuing Education class in astronomy at the Observatory in 1979. It was marvelous to see the dome open and to use the telescope to explore the night sky.

Al graduated in mechanical engineering in June 1958. Exhibit-20 is a graduation photo taken at the Observatory of me, daughter Katherine, and Al.

After Al and I were married we saw Dick and Coralee Eastley socially a number of times. After their divorce, we continued our friendship with Coralee, her present husband Bob Northard, and family. We lost track of Dick.

For the next 12 years Al worked at Martin-Marietta in aerospace engineering. During that time, he dedicated his efforts to upholding quality control standards on the Titan Missile Project. He conducted environmental qualification tests, and coordinated, monitored and critiqued test results.

In later years he gladly changed his focus to environmental issues. Al worked ten years for the National Park Service, overseeing the water treatment plants of the Northwest Sector.

Al died of a heart attack June 24, 1986, just before his 60th birthday. He is survived by myself and his three daughters, Katherine Kouris, Cynthia Kouris-Wilkerson, and Julia Kouris.
EXHIBIT 36: Joanne, Katherine, and Al, 1958
Coralee's Memories

Dick Eastley and I were married on October 7, 1954. After a brief honeymoon we moved into the Observatory. We slept and lived on the 2nd floor apartment which consisted of two rooms. The kitchen, on the ground floor, was where we spent a great deal of time. Most of our friends seemed to enjoy congregating in that tiny room. It had huge windows that looked out on the back grounds, where we saw the seasons pass by. In October and November we saw football and soccer. In December and January snowmen and snow forts were everywhere. February and March brought out more games and kites.

We generally cooked meals for one or two friends before going to a movie or some other activity. Dr. Recht stressed no parties which wasn't a problem for us. The stove was especially interesting as the thermostat didn't work in the oven. I had to learn the precise moment to open the door and close the door, to keep the heat constant. Although a challenge, I eventually learned to manage temperature control and was able to make better cakes and pies.

One of the responsibilities in staying in the Observatory was to see that the building was clean. We each had our jobs and every Friday night we did major cleaning, and just checked that everything was ok after that. Dick took the responsibility for cleaning the dome room. He was particular about cleaning and keeping Observatory rules.

I found the room the earthquake scale was in, most interesting. We checked almost every day to see if there had been any activity. Of course we lacked the knowledge to read and understand the instrument. However, it was interesting to see and note recorded patterns. Sometimes earthquakes were of enough strength to be mentioned in the newspaper, and made the earthquake scale more interesting to watch.

The telescope was interesting with its huge supporting pedestal in the basement. The huge pedestal made you realize the telescope was big and heavy. I never attended any classes or events when Dr Recht demonstrated telescope capabilities. Dick had attended classes previously and enjoyed telling me about them.

When the men lived at the Observatory they went to the Men's Gym at the University to take showers and clean up. When I moved in the Observatory, showering was too complicated for me. Therefore, Dick made a primitive shower from a watering can and a ladder which we set up near the boiler in the basement.
One of us stepped up the ladder with a pail of water and filled the sprinkler can with warm/hot water. After that person showered, we switched. After we showered, we cleaned up the basement before heading off for the night.

Dick and I agreed to separate and eventually divorced after seven months of marriage. After our divorce, I moved to California for three years. He completed his degree in Mathematics at D.U. and worked at The Martin Company in Englewood for several years.

I later returned to Colorado and accepted a position at The Martin Company in the main building, working for fifteen engineers. My job was to listen on the telephone during missile launch countdowns in Florida. When they had a problem with a piece of equipment, I obtained the corresponding part from the tool shed in the area where missiles were being assembled. Then I took it back to the engineers who resolved the problem with Florida personnel.

I re-married three years later. My husband was in the Military in Army Attaché. We traveled to Embassies in Iran, Finland, Poland and Greece. He retired in San Antonio, Texas in 1979 after 31 years of service.