

# Personal Recollections of Frederick C. Leonard, Part II

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When I was a student, Leonard taught classical courses in observational astronomy and spherical astronomy, but his pride and joy was Astronomy 118, Meteoritics. He offered the first class in the fall semester of 1937. This was only the second time a class had been dedicated to meteorites in any American university. In my mind, this should be enough to make him a hero to modern meteoriticists. It was not considered an academic discipline throughout most of his career, and one wonders how he managed to convince university officials to offer it as an accredited course. Leonard proudly announced this "upper division" class in the *Contributions*, No. 3, 1937.

I studied meteoritics in 1958 and well remember the experience. Leonard had acquired about 40 copies of Farrington's 1915 edition of *Meteorites* which he loaned to his students to use as the primary text. There was nothing else available. At that time the science was very fluid. People were arguing about the classification of meteorites and to the students there seemed to be as many schemes to classify them as there were meteorite types. Leonard had his own scheme which he referred to as "The Simplified Classification of Meteorites" (see *Meteoritics*, Vol. 1, No. 2, 1954). In this scheme, he classified meteorites according to their mineral composition. He described three classes of meteoritic minerals: essential minerals (Class I); primary accessory minerals (Class II); and secondary accessory minerals (Class III). Along with this he developed a rather cumbersome symbolism for the classes and subclasses, which we had to commit to memory. (Ron Hartman's wife, Petrea, remembers him reciting Leonard's Simplified Classification on their first date, much to her bemusement). It didn't seem to matter to him that this system was not used in the growing field. With the exception of perhaps a single formal course Leonard was self taught in mineralogy. He used the text, *Mineralogy*, by Kraus, Hunt, and Ramsdell, 4th ed. which is now in the possession of Ron Hartman. On the inside front cover Leonard wrote, "Purchased from the publishers 51-11-12." On the opposite page he listed reading assignments from this book for a class called Mineralogy 6. This suggests he took a course in elementary mineralogy that year. Throughout the book he wrote comments which give me

a feeling for his mastery of the subject. For example, at the beginning of Chapter 2 entitled, Crystallography, he notes with some exasperation:

"A deliberate attempt to make an easy subject difficult! FCL."

Beneath that, in an apparent attempt to support his conclusion he quotes a statement by a Col. E. J. Sullivan, U.S.A. (ret.): "It was all so simple until the professors loused it up."

His meteoritics class was liberally salted with material he had published earlier in *Popular Astronomy* and *Meteoritics*, some of which had not received universal approval by meteoriticists. I am reminded of the name, Widmanstätten, as a case in point. In the *Contributions*, 1937 he argues that Count Alois von Widmanstätten's name had been misspelled for over a century and proposed that what he considered the correct name, Widmanstetter, be used for the well-known lamellar intergrowths in octahedrite meteorites. (Nevertheless, he reluctantly used Widmanstätten in his classes). In the same publication he argues vehemently that the name, "Meteor" Crater is "as absurd as it is improper." This word, meteor is almost universally misused today as an object rather than a physical phenomenon. This would never pass muster in Leonard's class. A wise student would carefully learn to use the proper terminology according to the professor's published opinion \_ or else. Leonard's love of terminology is apparent in his published papers. He helped establish the early vocabulary of meteoritics long before it was considered a true science. We can thank him for many of the words currently in use in the science today; *meteoriticist* and *meteoritics* being two of many. He selected the term meteoriticist over *meteoritician* calling the former "more euphonious."

Leonard was especially fond of his scheme for designating the position of a meteorite find or crater. In 1946 he had published the Provisional Coordinate Numbers of the Meteoritic Falls of the World using this scheme. The coordinates for Meteor (I beg your forgiveness, Dr. Leonard) Crater is indelibly imprinted on my brain: 1110,350. This, of course, was simply a statement of the longitude and latitude to the nearest 0.1 degree strung out without degree marks.

To say Leonard was pedantic is a fair description. He used to pride himself for his impeccable celestial sphere drawings made for the benefit of his Astronomy 4 classes. Indeed, he spent considerable time teaching me personally how to draw nearly perfect circles on the chalk board without a compass. (I am forever indebted to FCL for that bit of artistic trivia. I still receive applause for my near-perfect circles in

my astronomy classes). Even more remarkable, he could draw nearly perfect ellipses of all eccentricities within the meridian circle of his celestial spheres.

After a semester of instruction we became hypersensitive to the correct way to depict the celestial sphere. Then we entered Daniel Popper's Positional Astronomy class. Dr. Popper never mastered the ellipses and would draw them like simple thin lenses with both sides terminating on the celestial sphere as points. I must confess that Ron and I saw a rare opportunity to have fun with Daniel Popper, who had just embarrassed me in class by asking me to derive a spherical trigonometric equation for which I was ill prepared. We sneaked into the astronomy office after hours and drew a typical Popperian celestial sphere on the large chalk board behind the secretary's desk in the foyer. Ron had mastered and could replicate perfectly the ornate scrolls spelling out, 'FCL', which was Leonard's trademark. He made reference to the pointed ellipses and reprimanded Popper for his lack of artistic skills, cautioning him to repair the errors of his ways. Ron then initialed the work. The next morning it was seen by all who passed through the office, including Dr. Popper. Amazingly, the drawing remained all day long. Perhaps it was because Leonard was department chairman, and who wanted to tackle the top man. Even more amazing, Leonard seemed not to have taken notice. I secretly believe he was aware and rather enjoyed the reprimand to a colleague who could not compete with him in this aspect of astronomy.

Leonard's pride and joy was, of course, the meteorite collection which combined his own extensive private collection and meteorites purchased with departmental funds. At the time of his death, his collection was one of the largest in the world, containing about one eighth of all the known meteorites. When the Astronomy Department moved from Royce Hall to the new Astronomy/Math building in 1956, there was a small room at one end of the department that was labeled "Meteorite Museum". Beautiful, spotless glass cases lined the walls with every conceivable type of meteorite \_ individuals and slices. Leonard had been collecting meteorites for years and at last they had found a home. I often found him alone in the museum gazing with satisfaction and admiration at his "children". The slices were some of the most beautifully prepared specimens I had ever seen. We students of meteoritics all wanted to handle them, to examine them closeup under magnifier and microscope but that was not to be. Not for human hands, these celestial deities. At no time do I ever remember examining meteorites in class, only pictures and, of course, the sacred specimens in the "church". There was only one specimen that we could fondle \_ a 250 pound Canyon Diablo meteorite resting on a small bench

beneath the only window in the museum. Leonard was confident no one could cart that monster off. Wrong!

One night the great meteorite, Leonard's largest, mysteriously disappeared. We weren't there when Leonard walked into his museum the following morning. A child was missing! By the time we nonchalantly wandered in, the meteorite was back in its rightful place. We don't know who found it. We do know where it had been placed: in a tiny closet at one end of the museum. Leonard undoubtedly had found it and had gotten a few students to haul it back. He never said a word about the "theft" to us but our message was quite clear \_ tie it down or lose it!

One of Leonard's aggravations was Building and Grounds' insistence on labeling all state property with impossible-to-remove labels. This was a new policy. A representative from Building and Grounds visited the museum and wanted to inventory the meteorites. Part of the inventory process was to affix a label to each. This elicited a Vesuvian reaction from Leonard. He refused, of course, to attach the labels himself. I clearly remember a beautifully polished pallasite slice, one of Leonard's favorites, and discussing with Ron how that specimen would look with a label attached. The meteorite lay on the bottom shelf of the glass case which, of course, was kept under lock and key. Somehow a lone label was left in the museum that day after Leonard had taken the envelope of labels back to his office for filing. We used to study in the meteorite museum late at night after everyone had left. That evening we found the label and a mysterious attraction seemed to draw meteorite and label together. We had long ago figured out how to enter these locked cases without a key. It seems that the security of the lock was a charade. The glass could easily be removed at the top of the case. Then all one had to do was make a sketch of the exact position of each meteorite on each shelf before removing the meteorites and shelf, until we reached the bottom. This we did with great skill. Then we carefully placed the label flat over the polished pallasite and replaced the shelves with the meteorites exactly in place.

The next morning we found the label still on the meteorite. Leonard must have seen it; but the label stayed right where we placed it until his death. He surely must have wondered how the "property people" had opened the case. Perhaps they were serious about this property label business. As for the perpetrators, we were frankly disappointed not to have the opportunity to demonstrate our cleverness to the master.

It must be obvious to all who have investigated Leonard's history that he was not a researcher. He was a collector. Search as you might, you will not find any

papers he authored on any ongoing research. Perhaps he couldn't bear to see his precious meteorites sliced up, ground up, attacked by chemicals and subatomic particles. All his published papers were either organizational, classificational or literary, never scientific. (His Simplified Classificational Scheme might be considered by some, scientific). Perhaps this was in part due to his lack of manipulative and mechanical skills. He was not familiar with the use of the most basic mechanical tools beyond a screw driver and pliers. This trait struck home to all three of us when we accompanied Leonard to Meteor Crater. This trip was one of the optional activities Leonard offered his meteoritics students. It was usually in the spring during Easter recess. He would never take a university vehicle. We would usually car pool with a few students' cars. This trip was a love/hate affair for Leonard. He hated the heat. In the 1950s few cars were equipped with air conditioning. Traveling across the Mohave Desert was stressful to him and he suffered terribly. It's no wonder. He never dressed in anything but a double-breasted suit with vest and sometimes a sweater, even on field trips. The rest of us wore shorts and tee shirts. Relief would come as we climbed the rim country into the forested land around Williams and Flagstaff. His demeanor would improve "in direct relationship to the increase in altitude," he would claim.

At the Crater, the students really had only one requirement to meet. They had to "circumambulate" the crater, a three mile trek, and those hardiest could chose to descend to the crater floor. This was a marvelous time for all of us. As Leonard's students, we were free to roam the Crater and search for meteorites. Curator George Foster (and later, Foster Thompson) was a perfect host. I think George was a bit awed by Leonard, the learned professor. Leonard would roam the land around the Crater searching for surface specimens with Nininger's magnet-on-a-stick. He always came back with a dozen or so. One year the three of us purchased an army mine detector with a heavy battery backpack that almost killed us. But it was worth it. We began to find meteorites beneath the surface. I clearly remember the day. We were in the northwest quadrant next to the road about 2 miles from the crater when Ron Oriti acquired a strong signal. We dug up a 1/2 pound meteorite and raced to show it to Leonard. The moment was electric. Leonard was ecstatic. The three of us wanted Leonard to find a subsurface meteorite just to watch his reaction, but we knew he couldn't manage the heavy battery pack. We toyed with the idea of planting a specimen with a well-stained label: "At last! I have been waiting 50,000 years for you to find me." But none of us had the courage to set it up.

On the way back from the Crater, Leonard would suffer in reverse. There was no interstate highway system back in the late 1950s. Highway 66 was simply a

two lane road with steep embankments on either side. Suddenly, just outside Seligman, Arizona the right rear tire went flat on my 1954 Chevy. Leonard, sitting in the back seat, showed signs of respiratory failure. I struggled to keep the car from flipping over on the steep shoulder. Finally it came to rest, tilted precariously on the slope. We all got out and I proceeded to jack up the rear. I had just removed the flat tire when a Greyhound bus roared by, pushing a volume of air around it. The air blast struck the car and it began to slip sideways on the bumper jack. I yelled for everyone to lean on the down slope side of the car. That left Leonard to ease the jack down, which would have lowered the car onto its right rear rim. It was a critical moment. One more bus or 18 wheeler would certainly roll the car, with the students under it. I yelled at Leonard to lower the jack. Then the most astounding revelation hit us. Leonard grabbed the jack handle with obvious confusion and proceeded to "pump" the jack. He didn't realize you had to apply a strong downward force to ratchet the jack. He looked at me with the greatest distress in his eyes and cried, "The mechanism is not functioning properly!" I raced around the back of the car, shoved the spare tire under the rim hoping that would keep the car from rolling and lunged for the jack, pushing Leonard out of the way. Bearing down, I slowly lowered the car onto the spare tire. Leonard stood there wide-eyed and speechless. Then he cast an admiring look at me, smiled and proceeded to proclaim me a mechanical genius \_ and he was serious. We all howled with laughter \_ but he meant it.

Like some nagging child Leonard impatiently counted the miles back from the Crater. As we descended the Colorado Plateau he would audibly long for the California border. One time the heat was so unbearable to him that he made a vow to dance at the border crossing if only we could reach it. We students, of course, made him keep his promise. At the half way point on our journey, there on the banks of the Colorado River at Needles, California, the distinguished Frederick C. Leonard complete with double-breasted suit danced a jig with Ronald Oriti! That was a memorable day.

### **Who was Frederick C. Leonard?**

Frederick C. Leonard was not a great scientist nor did he win awards for distinguished teaching. His doctoral work at the University of California at Berkeley on the spectra of visual double stars provided important data fundamental to an understanding of the H-R Diagram and showed great promise for the future. But that was not to be. Somewhere, somehow, in his early career he discovered his passion for meteorites. Just what sparked that passion perhaps we will never know. All earlier interests became secondary.

But to those of us who knew him best, he transcends any perceived academic limitations. He was a man with a misplaced passion, a passion for rocks from space; misplaced because he chose a science that didn't really exist at that time; misplaced because he wasn't adequately prepared for the science it involved; and misplaced because it wasn't quite the right time, and when the time came, it was too late. His role was not to do the science; rather, he dedicated his career and his life to the establishment of the science. He had an extraordinary way with those lucky few students who could learn to love and therefore overlook his old-fashioned ways. He profoundly influenced our lives by being first and foremost an extraordinarily caring human being. He was there when we needed him, while his colleagues remained rather aloof and distant to our needs. The value of his teaching was not in the science he tried to reveal. Rather, he taught us the value of being thorough and precise in whatever we chose to do in life. The meteorites we studied under his tutorship would have simply remained as rocks in our memories without the special touch of FCL behind them. He left me with a lifelong appreciation for meteorites for which I will be forever grateful. I consider my book a tribute to Frederick Leonard, for like him I too found a passion with little preparation for the science it involves today. Like him, I can only hope to touch others in ways I learned from this remarkable human being. If this can in some small way help to advance the science then I, like Frederick Leonard, will have succeeded.