Frank Sacherer

A Story of Defying Gravity and Accelerating Physics

Alyssa McKinney
May 19th, 2021

I give permission to have this posted publicly on the web.

Forward

For many rock climbers, reaching the summit and standing on the edge of the precipice of a mountain, looking down on the world around them, is the ultimate reward for their hard work and determination. For many scientists, this feeling is felt completing a project and standing on the edge of the precipice of scientific discovery, looking ahead towards the brave new world. Perhaps this feeling is why Frank Sacherer, visionary rock climber and accomplished physicist, pursued both so eagerly. Before his tragic death at just 38 in a climbing accident, Sacherer was described as bold, ambitious, and promising in both the climbing and physics communities. This biography is my attempt to tell his story.

Early Life and Education

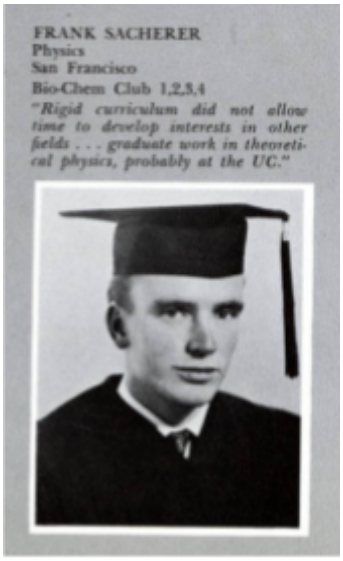
Franklin James Sacherer was born on March 22, 1940, in San Francisco, to parents Elmer Frank Sacherer and Verna Catherine Johnston Sacherer. In 1958, he graduated from St. Ignatius High School. He graduated from the University of San Francisco in 1962 with a degree in physics. According to his yearbook bio, he was a member of the Bio-Chem Club for four years. The Bio-Chem Club's stated mission was to promote and foster an interest in scientific pursuits among students through weekly discussions on current research, social gatherings, and lectures by eminent scientists. In the 1962 edition of "The Don," USF's yearbook, the following tongue-in-cheek description was written for the club:

"It was another abnormal year for this anomalous club. Despite the perils of a scientific major, the club membership remained lofty. The annual Halloween Mixer overcame peculiar perplexities to develop into the most outstanding social event of the year. The exchequer was also enriched vastly. Mountains of Kennedy-made pizza were devoured at the less-than-sensational Christmas party where the livest wire was a blown fuse. Guest lectures arose out of the club's own midst and enthralled us with their own brilliant analysis. The field trip to California Research Corporation was intellectually satisfying to those who attended. The highlight of the trip was a one and one-half hour wait 200 feet from the tunnel as the Hump claimed another victim.

Frank Sacherer, freshman year, with the Bio-Chem Club (second row, furthest to the left)

Another group of young, liberal, crew-cut leaders assumed office in 1961, ably led by casual Bob Kolar, who managed to tear himself from the basketball court long enough to attend club meetings. The second in command was Lt. Bob Devine, who with his effervescent personality saw that every little action was carried out to perfection. The products of our endeavors were aptly distorted by the frustrated humorist, Mike Gillin. The honor of pilfering the club piggy bank fell to Bob Firpo, who this year introduced the idea of keeping written books. The less-desirable were escorted through the door by that mountain of a man, smiling Emil Moy. The candy giver, Larry Kennedy, planned a vast social cotillion and other less notable events. The general tool for extravaganzas was shy, bashful Jim Cattalini. And last but most necessary come those strange creatures called members, who, with their ardent support enabled the leaders to carry out the far-reaching programs."

Charles Darwin (1809 - 1882) and Albert Einstein (1879 - 1955), were listed as club members in the club's 1962 yearbook photo. Assumedly, another practical joke.



Frank Sacherer, senior year at USF

Sacherer's plans after graduation, in his own words, was "graduate work in theoretical physics, probably at the UC" citing that USF's "rigid curriculum did not allow time to develop interests in other fields." True to his prediction, Sacherer went on to study theoretical physics at the University of California at Berkeley, earning his Ph.D. in 1968.

Sacherer started climbing in 1960, during his time at USF. He established a number of climbs in Yosemite Valley from 1961 to 1965, though he continued to climb throughout his life.

On November 6th, 1965, he married Janice Marie Baker. The two moved to Europe in January of 1969 and lived in a Volkswagen Bus, traveling for most of the year around Austria, Germany, Yugoslavia, Greece, and many other countries. In late October of that year, he applied for a job at CERN in Geneva, Switzerland, and was hired a day later. Sacherer would eventually be divorced in 1971.

<u>The Physicist</u>

Sacherer published his thesis paper, titled "Transverse Space - Charge Effects in Circular Accelerators," under his Ph.D. supervisor Lloyd Smith in 1968. Sitting at over 120 pages, the paper covered uniformly charged beams in the presence of gradient errors and collective oscillations of one-dimensional beams confined by harmonic potentials.


Frank Sacherer, 1968, at Camp 4, Yosemite National Park

In 1971, Sacherer published "RMS Envelope Equations with Space Charge" at CERN - a paper that has been cited by at least 559 other publications, according to Google Scholar's database. His research built on the fact that envelope equations for a continuous beam with uniform charge density and elliptical cross-section were valid for any charge distribution with elliptical symmetry, "provided the beam boundary and emittance are defined by root-mean-square (RMS) values". This approach had previously been demonstrated for stationary distributions by Lapostolle and continuous beams with axial symmetry by Gluckstern. Sacherer extended this to continuous beams with elliptical symmetry and bunched beams with ellipsoidal form, as well as to one-dimensional motion.

According to the paper, possible uses of Sacherer's equations include the "specification of stationary or matched states in the presence of space charge...another use is the design of low-energy beam transfer lines."

Sacherer's other popularly cited papers include "A Longitudinal Stability Criterion for Bunched Beams" (1973), "Bunch Lengthening and Microwave Instability" (1977), "Traverse Bunched Beam Instabilities: Theory" (1974), and, posthumously, "Methods for Measuring Transverse Coupling Impedances in Circular Accelerators" (1979).

Sacherer worked on the basic theory of the instability of particle beams as they circulate. He systematically categorized them, a great contribution for future physicists. He derived the fundamental formula describing the instabilities, known as the "Sacherer Integral."

According to Sacherer's supervisor, Smith, "his major interest had been in collective effects, phenomena arising from the interaction of intense beams with themselves and their surroundings and which, in large part, limit achievable intensities in high-energy accelerators. He established a general framework for dealing with these effects, which is in wide use."

He was also considered a leading authority on stochastic cooling. "One such facility is now under construction at CERN and another is planned for FermiLab; the confidence to go ahead with such plans is due in considerable part to Sacherer's contributions in understanding and controlling the process," said Lloyd.

In 1982, Simon van der Meer won the Nobel Prize in physics. In his Nobel autobiography, he credits Sacherer for his contributions which van der Meer would later build on.

Each year, the International Particle Accelerator Conference awards The Frank Sacherer Prize, "for an individual in the early part of his or her career, having made a recent significant, original contribution to the accelerator field."

Smith mourned the early loss of Sacherer, "whose help we were counting on for many years to come."

<u>The Climber</u>

Sacherer is highly regarded in the climbing community amongst those who know him and his contributions. In fact, most of the stories that reveal who Sacherer actually was, come from his fellow climbers. He was most famously known for his free climbing, which is a form of rock climbing in which equipment is not used for making progress up the climb (although it can be used for safety purposes). A first ascent (FA) is the first successful, documented climb of a route. A first free ascent (FFA) is the first climb without using equipment to aid progression or to rest on the side of the rock.

A compiled list of Sacherer's known FA's and FFA's can be found in an unexpected place: a forum post on SuperTopo, a rock climbing website, written by Ed Hartouni. Hartouni is, like Sacherer was, a physicist and climber living in California.

> ***1961:***
> *"El Cap Tree Direct 5.9 A4 IV FA 1961 Glen Denny Frank Sacherer*
> *Coonyard Pinnacle 5.9 R FFA 1961 Chuck Ostin Frank Sacherer*
> ***1962:***
> *Bishop's Balcony 5.5 A3 FA 1962 Frank Sacherer, Gary Colliver*
> *Reed's Pinnacle Left Side 5.10a FA 1962 Frank Sacherer, Wally Reed, Gary Colliver; FFA 1962 Frank Sacherer, Dick Erb, Larry Marshik*
> *West Buttress Ribbon Falls 5.8 A3 IV FA 1962 Frank Sacherer, Bob Kamps*
> *Crack of Despair 5.10a FA 1962 Frank Sacherer, Galen Rowell; FFA 1964 Frank Sacherer, Chuck Pratt, Tom Gerughty*
> *Wendy 5.9 FA 1962 Frank Sacherer Bob Kamps; FFA 1970 Kim Schmitz Marty Martin*
> *Right Side Worst Error 5.10a FA 1962 Frank Sacherer Galen Rowell*
> *Right Side of The Hourglass 5.10a FA 1962 Bob Kamps Frank Sacherer FFA 1964 Frank Sacherer Tom Gerughty*
> *Koko Ledge, Continuation A4 FA 1962 Glenn Denny Frank Sacherer*
> ***1963:***
> *West Face of Lower Cathedral Rock 5.8 A2 III FA 1963 Frank Sacherer, Wally Reed*
> *Tweedle Dee 5.8 FA 1963 Frank Sacherer Jim Baldwin*
> *Lower Cathedral Spire, Northeast Face 5.9 FA 1963 Mark Powell Frank Sacherer Bob Kamps*
> *Moby Dick, Left 5.9 FA 1963 Bob Kamps Frank Sacherer*
> *The Rorp 5.7 FA 1963 Wally Reed Frank Sacherer*
> *Moby Dick, Center 5.10a FFA 1963 Frank Sacherer Steve Roper*
> ***1964:***
> *The Flakes 5.8 R FA 1964 Frank Sacherer, Mark Powell*
> *Moby Dick, Ahab 5.10b FA 1964 Frank Sacherer, Jim Bridwell*
> *Reed's Pinnacle Direct 5.10a FA 1964 Frank Sacherer, Mark Powell, Wally Reed, Gary Colliver, Andy Lichman,*
> *Chris Fredricks*
> *Sacherer Cracker 5.10a FA 1964 Frank Sacherer, Mike Sherrick*
> *Sacherer-Fredericks 5.10c FA 1964 Frank Sacherer, Chris Fredericks*
> *Bridalveil East 5.10c FFA 1964 Frank Sacherer John Morton*
> *The Dihardral 5.10c FFA 1964 Frank Sacherer Tom Gerughty*
> *East Buttress of El Capitan 5.10b FFA 1964 Frank Sacherer Wally Reed*
> *North East Buttress of Higher Cathedral Rock 5.9 IV FFA 1964 Frank Sacherer Jeff Dozier*
> *North Buttress of Middle Cathedral Rock 5.10a V FFA 1964 Frank Sacherer Jim Bridwell*
> *Observation Point 5.9 III FFA 1964 Frank Sacherer Wally Reed*
> *Yosemite Point Buttress, Direct Route 5.9 FFA 1964 Frank Sacherer Don Telshaw*
> *Salathe Route, Half Dome 5.10b R IV FFA1964 Frank Sacherer Bob Kamps Andy Lichtman*
> *Lost Arrow Chimney 5.10a FFA1964 Chuck Pratt Frank Sacherer*
> ***1965:***
> *Dromedary 5.8+ FA 1965 Frank Sacherer, Gordon Webster*
> *Lower Cathedral Spire, Fredricks-Sacherer Variation 5.9 FA 1965 Chris Fredericks Frank Sacherer TM Herbert*
> *Direct North Buttress of Middle Cathedral Rock 5.10b V FFA 1965 Frank Sacherer Eric Beck*
> *East Buttress of Middle Cathedral Rock 5.10c FFA1965 Frank Sacherer Ed Leeper"*

Modern climbs are graded on a range from 5.1 (very easy) to 5.15 (very difficult). Originally, however, they only went up to a 5.9, and the community has added additional grades as

equipment and training has improved. It is notable to point out that the first 5.10 grade was not added until 1961, and in 1962 Sacherer completed the first ascent for four different 5.10a climbs in Yosemite.

In "Middle Cathedral Commentary," written by Roger Breedlove and published in Mountain Magazine in 1976, Breedlove describes the history of Middle Cathedral Rock, a well-known cliff in Yosemite Valley. In the early 1960s, he says in the article, the "climbing character" of the cliff started changing from mostly free climbs to all-free climbs, mostly due to Sacherer. "He was climbing at a wild pace, taking the aid out of existing routes, and climbing new routes in his bold, sometimes reckless style," said Breedlove.

Yvon Chouinard, a fellow climber and the founder of outdoor clothing and gear company Patagonia, once said that Sacherer "always climbed on the verge of falling over backwards - using no more energy than was necessary to progress and rarely bothering to stop and place protection...apparently his belayers have been so completely gripped they were unable to use a camera. I have not been able to find a single photograph of Sacherer on a lead!"

Hartouni's post on SuperTopo now has almost 600 comments on it, filled with memories of Sacherer, his accomplishments, and his effect on today's climbers. He has been described as driven, principled, and kind. He was also said to have a short fuse which, according to Hartouni, "would detonate a stream of profanity when he went off." He was determined to climb strictly without aid, demanding that his partners "not cheat."

Frank Sacherer

One story tells of Sacherer leading the first ascent of the Crack of Despair. Apparently when he heard his climbing partner below him stop panting, Sacherer knew he had stopped to rest on a bolt. Sacherer yelled out that he better not use the bolt. His temper seemed to fuel bursts of power and speed on the side of the cliffs, probably aiding his quick limbs. Sacherer's style, wrote Chris Jones in his book, *Climbing in North America,* "was to get mad at the rock."

Another story tells of Sacherer belaying his partner, Dick Erb, on a free climb on one of the Cathedrals in Yosemite. Not known for his dedication to safety, Sacherer hadn't tied his ropes tightly, so when Erb slipped during a move, Sacherer began to be pulled off the ledge. While stopping himself, he lost control of the belay and Erb fell some distance. Sacherer controlled the slide by squeezing the rope, but burned his hands in the process to the point that he told Erb he better not fall since Sacherer probably couldn't catch him now that his hands were burned. Erb started to clip a bolt that was near him, which would ensure his

safety on the rest of the climb. Sacherer, not wanting to fail the free climb, snapped at him not to.

One poster said he used to climb with Sacherer. However, “all hell broke loose” on one climb. “At one point,” the poster wrote, “[Sacherer] was out 60 feet on a blank wall, off route, zero protection, flagellating and screaming at me some of his famous epithets...Needless to say we climbed together little from then on.”

The stories are plentiful amongst the many climbers who had encountered Sacherer: he preferred to bring cans of tuna and packages of mincemeat pie filling because he believed it was the most compact high energy food you could bring on a climb; he was highly intelligent and got top grades in school; he struggled to reconcile his work in physics and his upbringing in the church; he once fell 80 feet and cracked a rib during a climb because he omitted clipping into a number of pitons on his way up; he hated the cold.

A climber on Sacherer Cracker in Yosemite, FFA: Frank Sacherer and Mike Sherrick in 1964, rated 5.10a

Eventually, Sacherer’s time in Yosemite Valley came to an end. By 1966, wrote Jones, Sacherer “was through. He realized that if he kept up this pace he would probably be killed. His nerves were frayed, and there was a good job offer in Europe.” Shortly after, Sacherer moved to Switzerland where he would eventually gain employment at CERN.

Even long after leaving the Yosemite Valley area, Sacherer’s influence was felt in the climbing community. Legendary climber Jim “The Bird” Bridwell once wrote that Sacherer “did more to advance free climbing as we know it today than any other single person in America at that time.”

<u>The Person</u>

A lot of insight into Sacherer as a person comes from posts made by Jan, who was married to Sacherer from 1965 to 1971. She explained that Sacherer, like many physicists, lived in a different world. He would use physics to figure out crack climbing techniques and was excellent at abstract thinking, but struggled to put things into words.

“He called people names and obscenities I believe, from lack of a more standard social vocabulary,” she wrote. “I remember one equation that went on for 30 finely written pages...then, when we were in Europe, he would agonize for half a day over a simple one paragraph letter to his parents.”

An important piece to the puzzle is Sacherer’s religion, wrote Jan. He had many years of Catholic education but never went to church and didn’t seem to hold strictly to dogma. Instead, he considered the “mystical leanings” of great physicists and philosophers, particularly involving quantum mechanics and astronomy. He was dead set against drugs, but seemingly due to personal reasons rather than religion. He had a strong sense of personal ethics and was active in anti-Vietnam war activities at Berkeley, alongside Jan. He also seemed to believe that one should not enjoy oneself too much, as everything must be balanced. This, Jan believes, gave him drive and discipline.

Frank Sacherer and fellow climbers, 1965, at Camp 4 in Yosemite

“From my point of view,” wrote Jan, “the worst thing he was taught was the idea that compromise was the deadliest sin of all.” He liked the certainty in physics and climbing, and struggled without that certainty in human relationships. He tried to supervise “even the smallest details.” His traditionalist views, particularly when it came to women, deteriorated their marriage.

“Arguing logically with a genius trained by Jesuits is 99% of the time a losing proposition, I can assure you,” she wrote.

As a child, Sacherer played a number of pranks, including rewiring his front door bell to drive his parent’s crazy with ringing even though no one was there. He also dabbled in rocket building, helped by his father (mostly out of concern for safety). His parents were loving and supportive, but protested his avid climbing, fearing for his safety. They were devastated when they heard about his accident, not knowing he had even begun climbing again.

“Frank’s father also did not want him to be a physicist and preferred him to become an engineer instead. In his father’s eyes, engineers were normal, while he didn’t want his son to grow up ‘weird like Einstein,’” Jan wrote.

According to Dick Erb, who frequently climbed with Sacherer, even he second guessed his decision to go into physics.

“I'll never forget that afternoon I walked into our apartment. He'd just defended his thesis and was getting his PhD. He just sat and stared at the wall. Finally he turned and said, ‘I hate physics, but what else can I do? I've never even had a job,’” Erb wrote.

Jan, however, said not to take Sacherer’s dramatic statements at face value - he truly enjoyed his work. At the time, he probably just needed a break from the stress of studying, possibly contributing to his decision to take almost a year off to travel Europe.

Sacherer was said to be fascinating company and not without humour. John Morton, a fellow climber, wrote of his eager late-night mischief on campus, like crack climbing up campus buildings. He loved to have lively debates and spend time with friends and roommates; he was neither a social butterfly nor a recluse.

He was also a great mentor and teacher. Several have attested to the powerful impact Sacherer had on them and those he climbed with. He didn’t have the patience for formal teaching, but led many by example and would sometimes lead trips at the Sierra Club.

Frank Sacherer one week before his death in 1979. He died descending the Grandes Jorasses, pictured behind him.

Tragically, Sacherer and fellow physicist and climber, Joseph Weis, died while descending the Grandes Jorasses during a sudden storm. His ashes were scattered near his favorite Yosemite climb on the Lost Arrow Chimney.

“He was always extremely diffident about his accomplishments, bemoaning the fact that he couldn’t accomplish more.” - Lloyd Smith.

Citations

Accelerator Awards. IPAC20. (n.d.). https://www.ipac20.org/accelerator-awards/.

Baker, J. (n.d.). *Franklin James Sacherer (1940-1978) - Find A...* Find a Grave. https://www.findagrave.com/memorial/91906351/franklin-james-sacherer.

Breedlove, R. (1976). Middle Cathedral Commentary. *Mountain Magazine*, (52).

Frank Sacherer -- 1940 - 1978. SuperTopo. (n.d.). http://www.supertopo.com/climbing/thread.php?topic_id=268647.

Google. (n.d.). *Frank Sacherer*. Google Scholar. https://scholar.google.com/citations?user=MOOd3ocAAAAJ&hl=en.

Jones, C. (1997). *Climbing in North America*. Mountaineers.

McNamara, C. (n.d.). *Rock Routes Sacherer Cracker*. Planet Mountain. https://www.planetmountain.com/english/rock/routes/itineraries/scheda.php?lang=eng&id_itinerario=428&id_tipologia=38.

Sacherer, F. (n.d.). *RMS Envelope Equations with Space Charge*. IEEE Xplore. https://ieeexplore.ieee.org/document/4326293.

Smith, L. (1979, February 1). *Frank J. Sacherer*. Physics Today. https://physicstoday.scitation.org/doi/10.1063/1.2995421.

The Don 1959. CONTENTdm. (1959).https://digitalcollections.usfca.edu/digital/collection/p15129coll4/id/2790.

The Don 1960. CONTENTdm. (1960).https://digitalcollections.usfca.edu/digital/collection/p15129coll4/id/2975.

The Don 1962. CONTENTdm. (1962). https://digitalcollections.usfca.edu/digital/collection/p15129coll4/id/3650.

The Nobel Prize in Physics 1984. NobelPrize.org. (n.d.). https://www.nobelprize.org/prizes/physics/1984/meer/facts/.