

that she could still move and not wanting to wait for help in an area proven to be a rockfall zone, Fernandez and her partner continued onto a safe place where they could get help.

Mount Rainier is not known for the high quality of its rock, but rather for the fine snow and ice that hold the volcanic rock in place. The common belief that natural rockfall is minimized by climbing early in the day when the snow and ice are holding the rocks together and meltwater is at a minimum appears to have some validity, but there are other factors to consider. One such factor is that water expands upon freezing. Since the coldest time of a 24-hour summer diurnal cycle is generally around 4 or 5:00 a.m., it stands to reason that water droplets behind rocks are as likely or more likely to undergo freezing at this time. The expansion forces of these crystals are known to be huge and doubtless they may pry rock and boulders from their perches. This may at least partially explain the common movement of rocks during the coldest time of day and the countless rockfall accidents that occur even in the wee hours of the morning. (Source: Mike Gauthier, Climbing Ranger)

(Editor's Note: Other incidents on Mount Rainier included the following: Three stranded climbers who were trying to travel light and fast, but who overestimated their skills and physical abilities. They exhausted themselves and had to seek help from the rangers. Two medical incidents, not included in the data, were a 39-year-old man who experienced torn chest muscles and a 52-year-old man who did not reveal a previous history of back problems. Rangers had to take them from high camp by sled.)

FALL ON ROCK, RAPPEL ERROR—RAPPELLED OFF END OF ROPE

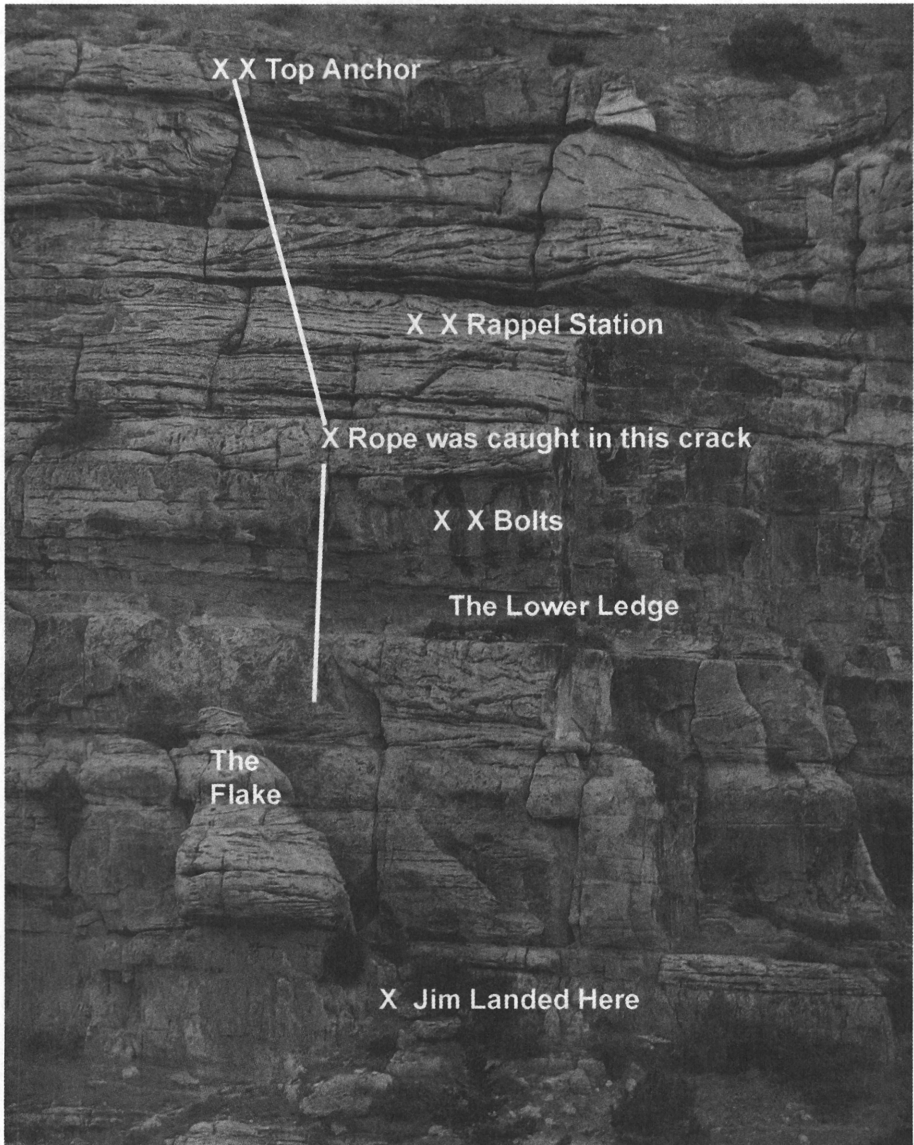
Wyoming, Lander, Sinks Canyon

On May 4, Jim Ratz (52) fell to his death while rappelling from a route called Honeycomb, four miles from his home in Lander.

The following description and analysis were the result of careful investigation on the part of the individuals cited below.

The climbing area and route. Honeycomb (5.9+) is a climb in Sinks Canyon State Park on the first sandstone buttress on the north side of the mouth of Sinks Canyon near Lander, WY. The climb is approximately 160 feet from the base to the top. There is a rappel anchor approximately three quarters of the way up the climb (about 120 feet) on a sloping ledge that is almost a hanging belay. There is another ledge, about 60 feet up from the base of the cliff, that is beneath the honeycomb (most difficult) section of the climb, which we will refer to as the "lower ledge." The lower ledge is very large and flat.

The plan. Jim set out at noon to do some laps (cycles of climbing up and rappelling off) on Honeycomb and to scout a location to add a bolt to



This picture by John Gookin shows relative heights and lateral positioning, which is important to understanding why we think Jim intentionally went to the lower ledge.

make the move over the roof better protected. Jim had climbed Honeycomb many times before and had climbed it with clients. Jim planned to join Tom Hargis after this to do some other climbs together.

The fall. Jim was found lying on his back by Tom Hargis at the bottom of the climb. Jim probably fell around 3:00 p.m. Tom and a friend were on a climbing route just around the corner from Jim and were expecting him to

join them after he did a few laps on Honeycomb. When they hadn't heard from Jim in a while, Tom went to check on him. Andy Blair was also there climbing and did CPR on Jim. Andy is a CPR Instructor, Wilderness EMT, and a first aid instructor for the Wilderness Medicine Institute of NOLS.

Analysis

The rappel and the origin of the fall. Jim's body was found 60 feet below the lower ledge and was close to the base of the cliff. This indicates that he fell from the area of the lower ledge. If he had fallen from higher up on the cliff, he likely would have hit the lower ledge during the fall. We (Hargis & Gookin) did not find blood anywhere on the cliff face. Deputy Coroner Bill Durnal also rappelled down the cliff face and couldn't find any blood.

When Jim switched to rappel, he needed to double his rope to make it retrievable. From the locked carabiners on his devices, we infer that Jim was using both devices (Reverso and autoblock) on the descent shortly before he fell, and that he rappelled to the end of the rope, which went to the lower ledge. The final position of the rope also indicates that he was at the lower ledge rather than the usual semi-hanging belay station that exists 87 feet above.

Position prior to fall. The greatest mystery is why Jim was on or near the lower ledge, but this fact is clearly established by his equipment and by his impact site. This is too far below the rappel station to be consistent with a momentary lapse in attention, since he had to rappel over a roof to get there, and he had to intentionally traverse right to get the rope in the crack where it remained.

One end of his doubled rappel rope was 8–10 feet longer than the other and he was at or near the end of one strand. When rappelling on a Reverso, the lack of rope-weight at the tail end makes it noticeably more difficult to brake the rappel.

The Equipment

The rope. He was using a new 60 m x 10.5 mm semi-dynamic, low-stretch climbing gym rope. (Jim measured this new rope at the NOLS Rocky Mountain equipment room two days before the incident and it measured 1.5 meters longer than 60 meters.) Rob Hess, co-owner of Jackson Hole Mountain Guides, says that new ropes are generally cut a little long while under tension, but that they quickly shorten to the marketed length upon use. This rope was brand new. It was not marked in the middle.

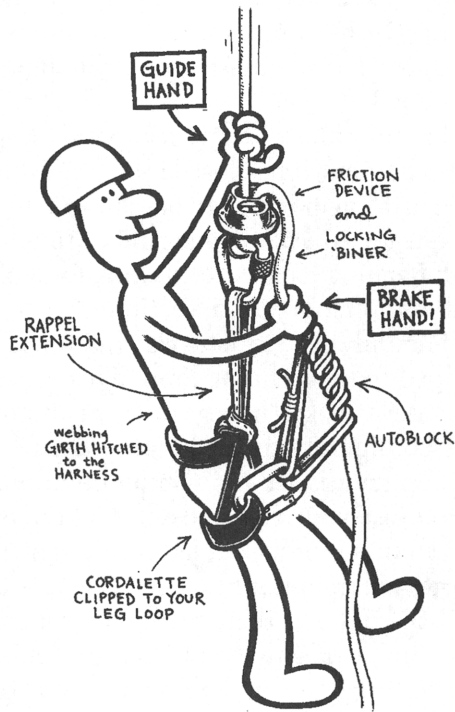
Jim's rope was found threaded through the two Metolius rap-hangers at the top of Honeycomb. The rap-hangers are larger than most bolt hangers specifically so you can thread a rappel rope directly through them without the need for a carabiner that would be left behind, but they have more rope drag than a carabiner does because of the sharper rope bend radius.

The rope was rigged for a pull-down rappel. When climbers rappel off Honeycomb and use the typical sloped belay station, there is considerable rope drag when trying to pull the anchor through the Metolius rap-hangers. When we re-rigged the rope, we were able to pull it (from the lower ledge) through the hangers with a moderate two-handed effort, but it also got caught easily and stuck in the vertical crack above the lower ledge.

Someone had pulled Jim's rope from the climb before we could inspect it in situ, but we do have a photograph taken before it was removed. The placement of the bottom of the rope indicated that Jim had been on the lower ledge beneath the rappel station. This is because the rope was pulled approximately ten to fifteen feet to the right side (looking up) of the natural fall line and was lying in a crack above the actual Honeycomb section of the climb.

One end of the rope stopped on the lower ledge. Another end went about ten feet below that ledge. One probable reason for this unevenness was because, as stated earlier, the middle of the rope was not marked. There was no knot in the end of the rope. Some climbing partners of Jim said that he wouldn't have knotted the rope in this situation because of the high potential to get the rope hung up in the cracks on that rappel.

The "Reverso" belay/rappel device. The device had a single *locked* Metolius Matrix carabiner. The fact that the carabiner was still locked indicated that he had rappelled through the end of the rope rather than unclipping from the rope. Jim typically used two carabiners for more rope drag while using thinner ropes. He had one carabiner rigged into the Reverso; the other was clipped on his harness but not clipped into the Reverso, which makes sense, since he was rappelling on a double strand of a slightly fatter rope (10.5mm) than usual.



This illustration by Mike Clelland shows one correct arrangement of a belay/rappel device and autoblock backup hitch. Jim chose to use a Reverso, but was not using an extension sling.

The autoblock loop. The loop was long enough that if Jim's body rotated it could bump his Reverso, rendering both the Reverso and the autoblock hitch ineffective, which could have triggered a rapid descent. To do this would require lifting and rotating his right leg inward. Jim had low speed abrasions on his right posterior: these marks support a scenario where a slip pushed his right leg forward and up, moving the autoblock towards the Reverso.

The carabiner was locked on his autoblock, indicating that it too had last been in use until reaching the end of the rope rather than being unclipped. (His climbing partners say he would have routinely left the carabiner gates unlocked if he unclipped them, because an unlocked carabiner is more ready to use than a locked one is.) The autoblock had at least three full double-turns of 6mm prussic cord (6 wrapped strands). The loop showed no signs of weld-abrasion or any telltale signs that indicated loss of control on rappel.

The autoblock belay backup was clipped to the top of the right leg loop of his harness. The closed loop was 20-inches of 6mm accessory cord. The loop had "memory" in it that showed that it had been hung on with full body weight for an extended period of time. This memory would be consistent with hanging hands-free to look for a placement for the bolt he wanted to add to the Honeycomb section.

The only system flaw we could find was that Jim's autoblock loop was clipped to his right leg loop. This is currently considered state-of-the-art because it makes it easy to unset the hitch by raising your leg high. But this configuration can be problematic in those rare instances when the backup knot is set and you unintentionally raise the right leg too high or if you lose your erect posture. There is no known history of accidents in this configuration, so it has received no press. But there are more and more stories emerging of near misses where climbers accidentally "bump" their backup knot into their friction device and trigger rapid descents. If there is one thing worse than not having a backup knot behind your rappel device, it is having a backup knot you depend on that might fail.

Injuries

- 1) Jim had a few bloody (pre-mortem) abrasions on his right posterior shoulder, elbow and thigh. This constellation of injuries is consistent with a low speed slide presumably at the start of his fall.
- 2) Important negatives: he had no rope burns on his hands or anywhere else. We can infer from this that he did not lose control while rappelling. He had no high-speed abrasions that would have indicated he hit or slid on the rock face during the fall.
- 3) Jim had a classic constellation of injuries that were consistent with landing hard on his feet. These include a vertically oriented basal skull fracture

and a bloodless tibia/fibula fracture. The skull fracture would have caused immediate death upon impact.

4) Jim's body also showed blunt force trauma, mostly to his back and the back of his head, indicating that he fell backwards after landing on his feet.

Probable scenarios

1) Many climbers use an autoblock to get into hands-free mode. Jim may have been locked off while exploring where and how to place a bolt to protect the roof move in this climb. Lifting his leg to move or bumping his leg upwards in a fall could have rendered his autoblock ineffective. A bump of his autoblock would have caused a quick descent, which may not have been recoverable so close to the end of the rope.

2) As he neared the bottom of the rappel, he had to pendulum out to bounce onto the ledge under the overhang. Even if he landed on that ledge, the nature of the landing tends to pull you back out to a position that causes you to teeter on the edge. If he had successfully landed on the ledge and had raised his right leg, his autoblock could have crept up and hit his Reverso, triggering a rapid descent. This could have happened just as he was landing on that ledge. He would have been near or at the end of his rope (and in this case, a single strand at that point), so the sudden descent would not have been recoverable.

If he did this over the large flake (noted as "flake" on photo) below the west end of that lower ledge, he could have fallen a few feet, received the low speed abrasions on his right posterior side, and then fallen further out from the cliff.

There are a few other possible scenarios that we feel are significantly less probable than these two.

Coroner's finding

Jim died instantly from a basal skull fracture secondary to landing hard and upright on his feet. The spine drove upward into the skull, causing immediate death. His tibia/fibula fracture was bloodless, indicating that his heart had stopped immediately. He had other head trauma that occurred as he fell backwards immediately after this incident, but it was the basal skull fracture from the hard landing that killed him instantly. He also had low speed abrasions with a little blood on his right posterior shoulder, arm, and right leg.

It should be noted that the medical examiner could find no indication of a major medical event that might have contributed to this incident. There were no signs of any toxicity.

These negative autopsy results do not rule out the many possible medical complications that would not be detectable but could have easily contributed to this accident. For instance, when the coroner was asked about a dizziness

episode Jim had complained about a month or so prior to his accident, the coroner responded that dizziness could easily have been from a cardiac arrhythmia or some other similar medical episode that could have triggered his fall but would have been undetectable by the forensic pathologist during the autopsy. This is a possible scenario, but there is no reason to think this is the probable scenario.

(NB: There are medical complications not detected by an autopsy. Some of these medical problems are truly undetectable while others would only be detected if specifically looked for.)

Tests conducted

Jim Richards and John Kanengieter re-rigged Jim Ratz's rope. Jim Richards then rappelled on it. When he got to the lower ledge, he only had two feet of rope to spare on each end. This means that Jim's rope, with uneven ends, would have run out of one strand of the dual rappel rope even sooner.

There was a two-bolt belay anchor installed at this ledge, above the ledge and ten feet to the right. For Jim to get to that anchor, he would have to move to the right, requiring even more rope.

The human factor

Jim Ratz co-owned Jackson Hole Mountain Guides. He was vice president of the board of trustees of the American Mountain Guides Association (AMGA). He was a former executive director of the National Outdoor Leadership School (NOLS) from 1984–1995. Jim had climbed and taught climbing since 1970. He was also a caver and had rappelled on static lines in pits over 1,000 feet deep. Jim was known to be a cautious and fastidious climber.

Local climbers and other guides who climbed with Jim say he was meticulous and thorough. He routinely checked and rechecked knots and systems. Jim displayed the careful habits expected of professional mountain guides. However, he may have been depending on a redundant safety system that occasionally doesn't work.

Jim may have made a serious error in judgment that we will never know about. While we cannot speculate as to Jim's state of mind at the time, we raise this point only because it is hard for us to conceive that with Jim's years of experience and level of skill that he would make a serious error in judgment during such a straight forward procedure that he had performed thousands of times in many settings and frequently on this particular route. It serves notice to all of us in the climbing community of the potential danger of losing concentration during familiar, routine tasks, as none of us is immune from being in a similar situation.

Recommendations

We recommend that the climbing community educate people about the problems associated with backup knots on leg loops and train people to

make brake devices and backup knots coaxial. While this scenario is not definitive in Jim's case, the increasing incidences of near misses are clear predictors that we should pay attention to.

An alternative rig that avoids this problem is attaching your friction device to your harness with a single sling to put the device further from your harness. Then attach the backup knot on the belay loop on the harness in a way that it backs up your brake hand. This makes both devices co-axial. By attaching the device and backup knot at similar places on your harness, it becomes very difficult, if not impossible, to bump your backup knot into your friction device. (See the diagram of this published in the Petzl catalog at [Petzl_122_123.jpg](#), which shows this coaxial arrangement.)

It can be said that tying the ends of the rappel ropes together would have prevented rappelling off the end. However, this climbing area has many vertical cracks left and right of the route (see photograph of the climb) and experienced climbers here have expressed great concern with having a knotted end caught in a crack. The result of this could prevent one from moving up or down, especially when doing roped solo climbing laps (an accepted form of climbing that has been done with very few incidents over the years), because minimal gear would be available for self-rescue. But this case clearly illuminates the fact that choosing to not use a backup knot in the end of a rope should not be taken lightly.

We recommend that the National Institute of Justice develop a national level coroner's form for recreational climbing fatalities. This is specifically because recreational climbing fatalities are so infrequent that local coroners need more guidance in preserving evidence at the scene. (Sources: Lead Investigator, John Gookin, Wyoming Deputy Coroner, SAR Commander with the Fremont County Sheriff's Office and the Curriculum Manager at the National Outdoor Leadership School [NOLS]; Tom Hargis, an AMGA certified guide for Exum Guide Service in other locations, a frequent climbing partner of Jim's who knew his habits and who bolted Honeycomb, so has knowledge of both the climb and the climber intimately; Jed Williamson, Managing Editor of this journal since 1974, and frequent investigator of accidents in a range of outdoor pursuits. John Gookin visited the site six times post-accident, Tom Hargis visited the site three times, and Jed Williamson visited the site once, with Gookin and Hargis. Williamson had numerous follow-up conversations and other exchanges with both.)

FALLING ROCK—DISLODGED BY PARTY ABOVE

Wyoming, Devil's Tower National Monument, Pseudo Weissner

On May 29, Rita Sanders (46) of Bellview, Nebraska, was injured by a falling rock while climbing on Devils Tower. Sanders was climbing the Pseudo