OPUNTIA

398

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Opuntia is published by Dale Speirs, Calgary, Alberta. It is posted on www.efanzines.com and www.fanac.org. My e-mail address is: opuntia57@hotmail.com When sending me an emailed letter of comment, please include your name and town in the message.

ROCKY MOUNTAIN WAY: HEALY CREEK
photos by Dale Speirs

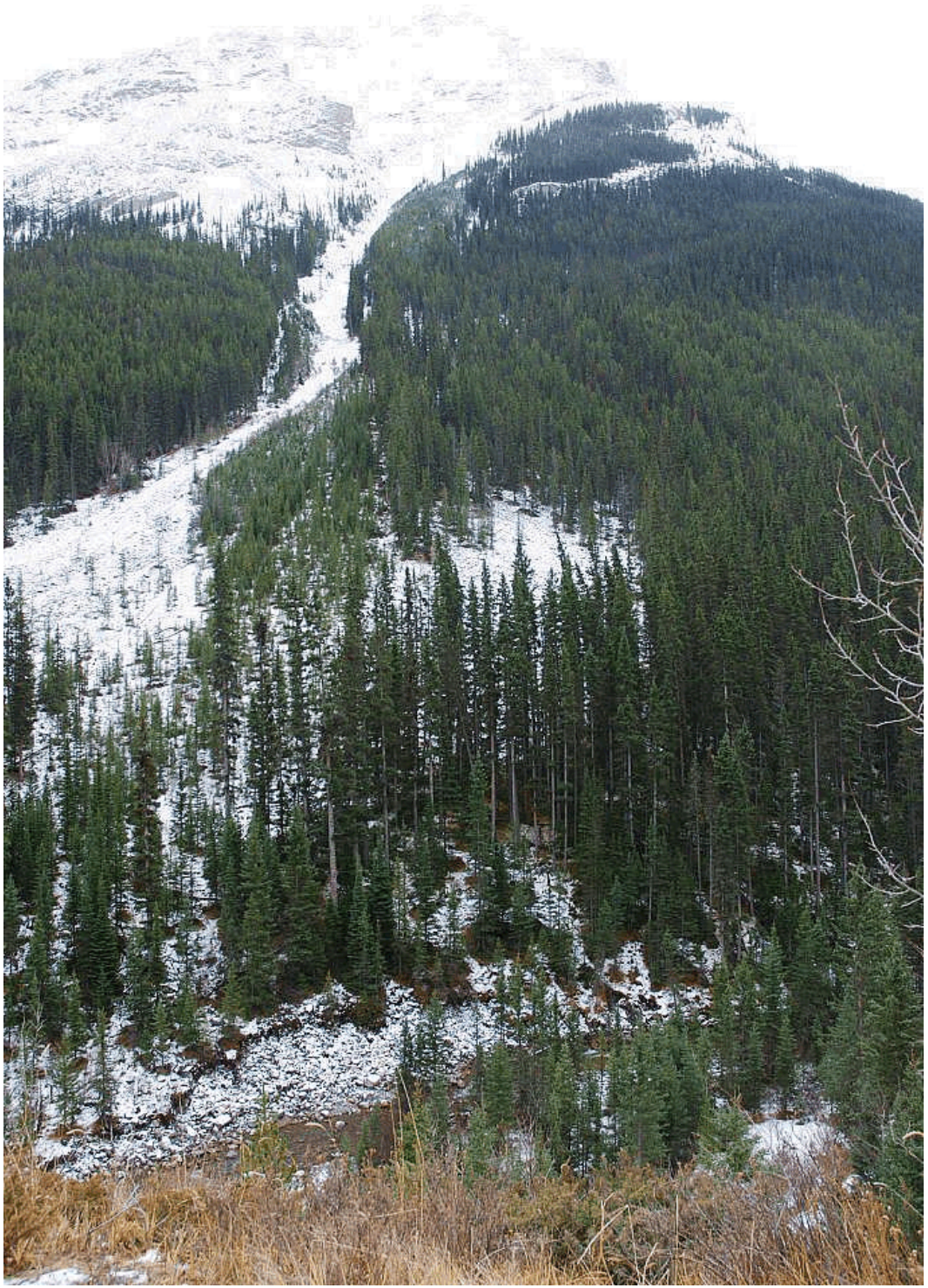
My final trip of the season into Banff National Park was on October 24. I went up the Healy Creek valley, located a fifteen-minute drive west of Banff where the Bow River makes a right-angle bend. The first snowfall had occurred in the mountaintops, so I had to stay down in the bottomlands.

It wasn't just me. The wildlife which had spent the summer up in the alpine meadows were coming down into the valleys for the winter. I took this telephoto of a bighorn sheep ewe and her lamb on the banks of Healy Creek.

At left: Avalanche chute on Eagle Mountain, with Healy Creek flowing along the bottom. The mountaintop is obscured by a snowstorm.

Below: A different view of the cliffs of Eagle Mountain, with multiple avalanche chutes.

Bottom: A mule deer leaped away from me the instant I raised the camera to take its photo.



On the opposite side of the valley, the north side, is Mount Bourgeau.

Far left: At the mouth of the valley, Healy Creek flows into Brewster Creek.

Above and near left: A short distance further, Brewster Creek hits a wall of cliffs and makes a right-angle turn eastwards to Banff, eventually merging into the Bow River across a tangle of muskeg.

COZY MYSTERIES: PART 4
by Dale Speirs

[Parts 1 to 3 appeared in OPUNTIAs #361, 379, and 395.]

Cozy mysteries have evolved into a standard format from their distant origin in the Miss Marple series. The book titles usually are puns. The main protagonist is an amateur sleuth who busily snoops about contaminating evidence, indirectly obstructing police, and getting into the line of fire from the murderer.

Cozy mysteries have developed a number of subgenres. There are several series involving cats, dogs, or birds. Food is popular, whether a restaurant or bakery. If there is a Website for a particular hobby or interest group, then there is probably a cozy mystery series for it.

A Cat May Look Upon A Corpse.

Lilian Jackson Braun basically founded the subgenre of cat cozies back in the 1960s, after which many imitators followed.

She has published more than thirty THE CAT WHO novels, as well as short stories. The novels involve the Siamese cats Koko and Yum Yum, and their nominal master Jim Quilleran.

THE CAT WHO TURNED ON AND OFF is a 1968 novel, a decade number you will not see on other cat cozy colophons. Quilleran is writing a newspaper feature about Junktown, a neighbourhood in the big city where antique and collectibles shops cluster. He gets into amateur sleuthing almost immediately when he learns of a dealer, Andrew Glanz, who supposedly died in a fall from a stepladder in his shop. Quilleran attends the auction of Glanz's estate and along the way ends up renting Glanz's apartment. From there, he roams the neighbourhood, looking for evidence as much as copy. Murder victim #2 (there is always a second victim in cozies) took a bad fall down some steps.

The cats help out, finding a secret passage and later accidently recording a drug dealer's conversation when Koko walked across a tape deck and switched it on. One of the dealers was selling heroin inside cheap trinkets, which the addicts would ask for. Glanz found out about it and had to be silenced.

THE CAT WHO SAW STARS (1999) takes place in Moose County, described as "*400 miles north of everywhere*". Quilleran is now a newspaper columnist in Pickax City, the county seat, population 3,000. An unknown backpacker who was hunting UFOs goes missing but not for long. Quilleran and Koko are out for a stroll along a beach when the cat sniffs out the body.

According to Forensics, the body was there four days, yet showed little decay. Some local residents declare it must have been a UFO abduction. Others try to grab their moment in the spotlights when they vouch for having seen a UFO buzzing the lake.

Not long after, when all that can be said about UFOs in Moose County has been, a local restauranteur with the unlikely name of Owen Bowen drowns out in the lake. So says his wife, who was the only witness. He was 48, she was 27, and she will bravely keep the restaurant going with the help of the handsome young chef.

The widow doesn't have long to celebrate, for she soon dies in a freak accident when a giant sinkhole opens up behind the restaurant and swallows her. Slightly more plausible is a subsequent sighting of a UFO by Quilleran and Koko. On that note, the novel trickles to an end. A bizarre ending, definitely not the standard cozy type.

Carole Nelson Douglas has a series of novels involving a fat black cat named Midnight Louie, and his mistress Temple Barr, who is a publicity agent in Las Vegas. The chapters of the novels alternate between various human viewpoints and the activities of Midnight Louis, and later in the series, his daughter Midnight Louise. OPUNTIA #48.1A had a review of CAT IN A KIWI CON, which was set at a sci-fi convention.

CAT IN AN ULTRAMARINE SCHEME is a 2010 installment in the series. This time around, Barr is helping publicize a new hotel casino which is themed about Mafia mobsters, including an underground Chunnel of Crime.

Needless to say, the city fathers are not too thrilled about this idea. A buried safe is found during excavations, and Barr uses it for a media event. It will be opened live on television. The hotel casino owners are the Fontanas, descendants of Mafioso but whose current generation has gone legit. They hire Tomas Santiago for Web and social media services to assist Barr's campaign.

Digression: One clanger is dropped at this point in the novel. It is remarked that Santiago, now 50 years old, had been designing Websites since he was 20. Assuming the novel took place the year it was published in 2010, this meant that Santiago was a Web designer in 1980. That was long before the WWW was publicly released by Timothy Berners-Lee in 1991.

There is a subplot set in Ireland, involving one of Barr's boyfriends, but which doesn't add much. Back in Sin City, the opening of the buried vault isn't quite the dud as Al Capone's safe was in 1986. Capone's safe was empty, but the Las Vegas safe has a two-day-old corpse in it.

The plot becomes over-complicated, with a conspiracy by a secret society called The Synth, a plan for a massive casino robbery, and a possible terrorist attack.

The corpse had been involved in a search for silver dollars stashed by old-time Mafioso, who knew paper currency wouldn't last but that silver coins were always good. There is a feeble epilogue that attempts to tie in the Irish radicals with the Las Vegas silver.

Midnight Louie wanders in and out of the plot, not really doing much. His interior dialogue is used to illuminate a few points here and there, but you could skip his musings and not miss anything in the story.

CAT IN AN ALIEN X-RAY (2013) starts off with a UFO scare in Las Vegas. Barr's private life is increasingly complicated by a tangle of current and ex-boyfriend's. No one, not her nor anyone in her circle, has a happy past life, and everyone has something to hide.

The novel opens with tourists claiming they saw UFOs hovering over the Strip. Naturally everyone assumes they are a publicity stunt. There are some conspiracies left over from previous novels in the series. The Synth is apparently trying to heist hidden IRA money stashed in Las Vegas.

Barr is hired by a man calling himself Silas T. Farnum. He is building a stealth hotel that can change its external appearance from one type of tower to another, even a skin that looks like an abandoned skyscraper. Farnum is aiming for the "*alien centered*" tourist, as he puts it. The hotel casino will be called Area 54.

One annoying problem is a corpse found on the site, ventilated by bullets. Farnum brushes that off, and gets busy on his fleet of dirigibles dressed up like UFOs, and the building itself. The body count increases, as one expects. Barr's friends are taking notice that she seems to be a jinx; as whatever project she is involved in will cost someone their life.

The plot veers away from all that as the storyline begins to clear up loose threads from earlier in the series. The final chapters are mostly about explaining things that happened two or three novels ago. It becomes very evident that this book is not a standalone but a mid-stream installment in a lengthier saga. Little of importance is wrapped up, since to do so would crimp future novels. An unsatisfactory ending.

Another long-running series of cat cozies is by Rita Mae Brown, involving Sneaky Pie, Mrs Murphy, and assorted other felines, plus one dog just to prove there's no discrimination. The animals have their own dialogue, in italics, and provide some of the background information in lieu of infodumps.

The setting is the small town of Crozet, Virginia, which has a murder rate that would shock a big-city policeman. The local Miss Marple is Mary Minor "Harry" Haristeen, owner of most of the cats, who always happens to be nearby when a corpse is discovered.

Be that as it may, the Class of 1980 high school reunion is underway, in PAWING THROUGH THE PAST (2000). Class members receive a note "You'll never get old", which is considered a joke until handsome Charlie Ashcraft dies from a bullet in the forehead. He was a womanizer who dallied with other men's wives, so it wasn't a complete shock. Haristeen is on the planning committee for the reunion, so naturally that brings her into the case.

The middle part of the novel fills in the extensive back stories and current jealousies of the classmates, the better to spread suspicion around. Victim #2, another classmate, is found in a dumpster, shot in the forehead. No prizes for guessing who found the body. The cats, of course. However, Haristeen isn't far behind.

The death toll rises steadily, and the news media are in a frenzy. Jokes are made about getting a bulldozer to dig a mass grave. The investigation narrows down to traumatic events from high school days. A victim of hazing and rape is getting revenge.

Along the way the murderer intends to clear out a few other people just because, including Haristeen. She survived, as she must since the series continued. The cats went on to prowl more crime scenes.

Rebecca M. Hale has a series of cat cozies set in San Francisco, an example of which is NINE LIVES LAST FOREVER (2010). The narrator, never named, has inherited an antiques shop from her Uncle Oscar.

The novel opens with a very specific plague of frogs, one in her shop and the other in City Hall. Her two cats Rupert and Isabella instantly give chase. There seems to be a connection to Oscar's secret life as a treasure hunter. His friends are dodgy at best but helpful most of the time. At least one of his enemies is trying to kill his niece.

Although the author does quite a bit of backfilling of the story, it is evident that these novels are chapters in an ongoing saga. There is much that can be missed if not read in strict order.

The niece and her cats, plus one of Oscar's weird friends, travel through a paranormal San Francisco. City Hall seems to be the focus. It is overrun by thousands upon thousands of frogs. The plot makes no sense to anyone other than a Coast-To-Coast AM fan. It even manages to work in the Harvey Milk murder to keep conspiracy theorists happy.

I gave up on this series after this novel. It is obviously an endless trilogy which will never have resolution as long as book sales hold up.

CONVENTIONAL FICTION: PART 7
by Dale Speirs

[Parts 1 to 6 appeared in OPUNTIAs #70.1A, 270, 285, 313, 364, and 385.]

Fiction set at conventions is not uncommon because it allows different types of people to mix and come into conflict. The author can pad out the word count explaining how the convention works and its associated fandom or occupation.

SF Conventions.

"The Fantasy People" by David Allen Ish (1956, NEW WORLD WRITING) is a short story written by someone who knew the style of SF conventions back then. It is set at a New York City convention attended by some New Jersey teenaged boys. The conversations are true-to-life, with people meeting and saying "*My God, it's been a year!*", and then moving on with a promise, never kept, to get together again at the convention.

The boys are mainly concerning with trying to score with femme fans, and the story meanders about Manhattan with little action. More of a vignette, but an accurate record by all accounts of how SF fans behaved back in the early 1950s at conventions.

SCI FI (1981) by William Marshall is set in Hong Kong, part of the Yellowthread Street series of police procedural novels. This particular installment has police flummoxed by unruly media fans attending the All-Asia SF and Horror Movie Festival. Cosplayers roam the streets annoying the citizenry and getting into enough trouble that the drunk tanks are overflowing.

Someone is using the convention as a cover to commit arson, dressed as a spaceman using a firefighter's silver suit and killing people with a death ray qua flamethrower. The police don't know why, but eventually realize the hotel safe has tens of millions of dollars in cash stored in it, as well as master copies of new SF movies. They have to figure if the plan is to heist the cash or to pirate the movies.

The novel is chaotic, with lots of people, including the police, running about like headless chickens and shouting at each other a lot. The writing style is a cross between noir and comedy, and comes across as just plain noisy. That said, it is a different type of convention novel and interesting reading.

MURDERCON by Richard Purtill is a 1982 novel set at a general SF convention, narrated by Athena Pierce. She is a philosophy professor appearing as a panelist, who inadvertently becomes a Miss Marple when the chairwoman of the convention is murdered.

Much of the novel is taken up by explanations about how a traditional SF convention operates, such as what a fanzine is. Pierce is a novice at conventions, so that gives the author an excuse to unload infodumps about how conventions function and the sociology thereof. Several pairs of antagonists are delineated so as to keep the reader guessing who and why the murder was done.

The murder apparently has something to do with an unknown Stanley Weinbaum story that another writer wants to remain unknown. He plagiarized it, thinking he had the only copy, and is unhappy to learn there is another that would lead to his exposure.

The investigation by police and Miss Marple, pardon me, Prof. Pierce, dredges up a plentitude of clues and red herrings. Another subplot takes shape, that of a movie producer who attends SF conventions looking for young women who might be duped into making porno movies.

The pacing of the novel is slow for an experienced con-goer who has to skim through all the explanations. It finally trundles to the resolution in due time. A fair read.

WE'LL ALWAYS HAVE PARROTS (2004) is a cozy mystery novel by Donna Andrews set at a media SF convention, specifically one for a television series called PORFIRIA, QUEEN OF THE JUNGLE, set on the planet Amblyopia. The description of the convention and the behaviour of its fans is obviously based on the author's experience.

The protagonist is Meg Langslow, a dealer in swords and armament, who has a table in the bourse. Her boyfriend Michael is a supporting actor in the television show and a minor Guest of Honour. The hotel is a second-rate labyrinth of rooms and function space, made worse by the escape of dozens of parrots and monkeys from a jungle display. Fans had, with their usual good intentions and poor execution, tried to re-create Amblyopia at the convention.

The main GoH is the leading lady Tamerlaine Wynncliffe-Jones, originally Tammy Jones when she was a nobody. She had bought the comic book rights

upon which the show was based, cheating the artist out of substantial royalties. The artist who created the comic book series got all the character and place names from a medical dictionary, as good a place as any, so there is the fun of spotting the disease after which a television character is named.

TWJ has a giant ego, is a tyrant to all around her, and is thoroughly despised by her fellow actors, production crew, the convention committee, and anyone else who ever had the misfortune to meet her. Not surprisingly, she is abruptly sent off this world into the next life by a person unknown.

The police investigate, and it being a cozy mystery, so does Langslow. The investigation focuses on the immediate present and those conflicting with the defunct, but Langslow eventually discovers that it is based on the distant past when the comic book series was all that existed. Several suspects are convincingly arrayed on the hot seat one after the other before the final true culprit is identified, the man who really was the artist.

The novel is humourous, not laugh out loud but at least with plenty of grins and the occasional chuckle out loud. SF readers who have been to fan-run conventions will appreciate how the fans and concom are accurately described. A good read.

Comic Book Conventions.

Not the same as comic cons, where the original comics are put in the back room while the Hollywood studios parade their latest movies. ANTIQUES CON (2014) by Barbara Allan (pseudonym of husband and wife Barbara and Max Allan Collins) is part of a cozy series about an antique shop. Brandy Borne and her mother Vivian operate an antiques shop in the village of Serenity, Iowa.

They are attending a comic books convention in New York City for the purpose of selling a 1940s Superman drawing by Siegel and Shuster. It was found in an unclaimed storage locker auction in Iowa, but the Bornes are smart enough to realize the better place to sell it would be in New York City at a comics convention.

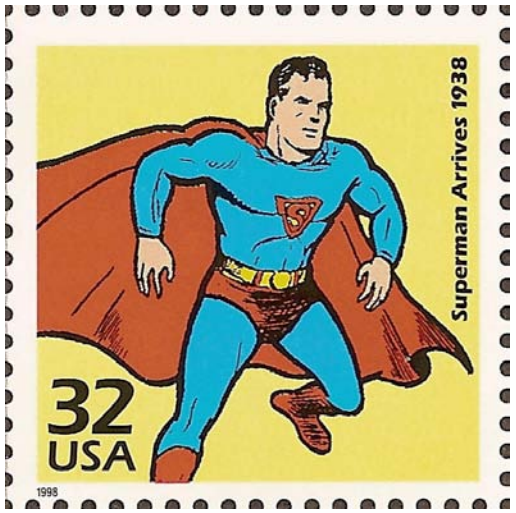
On arriving at the convention, they find there was a mistake in their hotel room booking. It is remedied by the convention chairman Tommy Bufford, who switches them into his suite. He is too busy working to enjoy the suite and only needs a place to sleep a few hours, so he takes their tiny tourist economy room. Bufford has all the usual difficulties of any chairman, plus a rival comics convention making legal threats.

The Bornes have their problems as well. The first night in their room, an intruder sneaks in but is frightened away when Brandy blows her rape whistle. They don't want the incident reported to police because the NYPD would automatically check their names on the computer. This novel is the eighth in the series, so the Serenity Police Department have a lengthy file on them from all the previous murder cases they interfered with.

Bufford's problems in running the convention are soon over, as he was stabbed to death in a service elevator. Guess who found the body? It means the intruder had been looking for Bufford and didn't know about the room switch. Vivian, who has been slowly drifting into senility, goes into full Miss Marple mode, obstructing justice left, right, and centre. She blabs confidential details to everyone, and even manages to drag in the Mafia.

Mother and daughter manage the feat of being the last persons seen with the next murder victim, who was stabbed while in the costume masquerade. It eventually transpires that a love triangle was behind the murders. The plot ends with a standard cozy fight to the death in an isolated area where no one can hear you scream.

Brandy is trapped on the hotel roof with the murderer. She is a good fighter though, and kicks him over the edge of the roof. That will save the District Attorney the trouble and expense of a trial.



The epilogue deals with the sale of the Siegel and Shuster artwork, which fetches a five-figure price at auction. The Bornes made money on the trip, after taxes that is. A humourous read.

Mystery Conventions.

"Murder At The Bouchercon" by Edward D. Hoch (1983 November, ELLERY QUEEN) takes place at the premier mystery fandom convention, the genre's equivalent of the SF Worldcon. The convention is set in New York City, and part of it involves a tribute to Conrad Kazer, a mystery writer who died in a house fire five years previously.

The Guest of Honour was Kazer's former editor. She wasn't particularly obnoxious, so one can feel a bit of sympathy when she is found in her hotel room with a knife in her back.

One of the attendees had bought the rights to Kazer's literary works and was trying to peddle them to her and the movie rights to Hollywood studios. There is some question about whether he had actually bought the rights or was just running a fraud. Another suspect is a bright young man who wants to set up a Kazercon, despite doubts of others that he knows how to run a convention.

Instead of a Miss Marple, there is a Mister Marple. Other than the gender change, he behaves much the same, including getting himself trapped by the murderer and almost becoming another victim. A pedestrian story by a pedestrian author, but it reads well.

BELL, BOOK, AND SCANDAL is a 2003 novel by Jill Churchill about housewife Jane Jeffry, a wannabe mystery writer. Her home town is hosting a mystery writers' convention, and she decides to attend in the hope of selling her manuscript to one of the editors or publishers.

Jeffry is rather naive about the process of peddling a story, which gives the author a chance to unload some infodumps about the publishing industry. Obviously written from Churchill's personal experience is a warning about the young Ivy League women with triple-barreled names who work as editors for minimal salaries. The explanation of what "baby editors" are and how they kill writers' careers is something every aspiring author should read.

There is the obligatory obnoxious Guest of Honour who was the first target, done by an unsuccessful poisoning. Victim #2 is a KTF book reviewer who has his head bashed in the same manner that he bashed novels. Neither of them actually die, but the murder attempts put both of them in hospital in serious condition.

Floating through the plot is the possibility that someone plagiarized a book and is about to be exposed. A cozy mystery that reads wells. It follows the standard plot for convention skullduggery but no harm in that.

Book Conventions.

MURDER AT THE ABA (1976) by Isaac Asimov takes place at the American Booksellers Association annual convention. The protagonist is author Darius Just, who opens the novel by contemplating the chain of events that led to the murder. If a feminist writer had not worn a certain dress, or if Just hadn't been twenty minutes late for an appearance at the convention, then the victim might still be alive.

Giles Devore, who was Just's protégée and is now eclipsing him, is the unfortunate defunct. He was intending to ditch his, and Just's, current publisher Prism Press, a small outfit run by Thomas and Teresa Valier. As Just remarks: "*Eternity lasts five minutes in the world of publishing*." Devore is full of himself, thinking he is a superstar when he actually has only two mildly successful books. He lets them go to his head and begins to busily make enemies and alienate old friends.

Asimov inserts himself as a character into the book, with orders from an editor to write a mystery story titled "Murder At The ABA". A little too self-referential, methinks. He does play fair though and presents himself as the boor he could be and often was. He was noted for groping women, which in these times would get him banned from many conventions, and probably charges or lawsuits from some of his victims.

Devore departs life suddenly, and Just is the one who finds the body. Playing the amateur detective isn't as easy as it seems in cozy mysteries, and Just finds himself being dragged backwards through the mess. As the police and security guards remind him, it is not enough to have suspicions, one must have solid evidence that survives in court.

After meandering his way through various suspects and clues, Just concludes that Devore was an innocent victim who was in the wrong place when a drug trafficker lost part of his stash. A trap is set to catch the murderer. It succeeds with just enough room to let Just smirk that he knew it all along. Asimov wrote in a clear style with no verbal pyrotechnics. His narrative pulls the reader along without gimmickry. Well recommended.

CATNAP (1992) by Carole Nelson Douglas was the first novel in a long-running series of cat cozy mysteries. The cat in question is Midnight Louie, who roams about Las Vegas while his mistress Temple Barr, a publicity agent, gets in and out of trouble, always with at least one corpse involved.

The venue of this particular novel is also the annual convention of the American Booksellers Association, for whom Barr was working. The setup, besides being the first meeting of Midnight Louie and Barr, involves a subgenre of murder mysteries about nurses or doctors gone wrong and who take advantage of their position to kill.

Two writers in that subgenre are not on the best of terms. It doesn't help that the publishing house producing the novels is undergoing changes in editorship. When one of those authors is stabbed on the convention floor after hours and his body hidden behind a display booth, the police and Barr go into action. Midnight Louie was the one who discovered the corpse, and Barr not long after.

To add to the confusion, two cats on display at the convention are kidnapped and a ransom demanded, but Barr thinks that might have been a diversion. The obvious motives are trotted out, but as an experienced reader of cozies will know, there is a different motive arising from some paragraph near the beginning of the novel.

Not professional rivalry or jealousy was the cause, but the dead man's previous life as a doctor who had his licence revoked after an abortion he performed went fatally wrong. That was decades ago, but the other children of the dead woman are now grown, and one is looking for revenge. Once Barr points him out at the J'accuse! meeting, he blabs everything of course. "*Yes! I did it! And I'd gladly do it again!*"

This first installment of the Midnight Louie series obviously reads well, elsewise it wouldn't have gone on to another twenty or so sequels. OPUNTIA #48.1A has a review of CAT IN A KIWI CON, which was set at a sci-fi convention.

Other Conventions.

The funniest piece of convention fiction ever written is a short story "The Anarchists' Convention" by John Sayles (1979 February, THE ATLANTIC, since reprinted in anthologies). Set at a Manhattan hotel, it is narrated by an old-time anarchist who worries they aren't attracting the younger generation: "*A half-hundred old crackpots tiptoeing across the carpet, wondering how they got past the velvet ropes and into the exhibit.*"

The bickering starts at the registration table, as anarchists object to the idea of name tags that might identify them. Mostly though, they are still feuding about factional debates from thirty years in the past. It reminds me of fanzine panels at SF conventions where the panelists gush over fanzines published decades ago while the audience fidgets in boredom.

At the banquet, there is a debate about whether grapes should have been served in the fruit cocktail, which was funnier then than it is now. Boomers will recall the grape boycott of that era. The narrator figures that since he hasn't eaten since breakfast and he's in his seventies, to hell with solidarity, he wants some food in his stomach.

The hotel manager inadvertently unites the anarchists when he comes to them and says there's been a mistake. The room was double-booked for the Rotary Club, who have priority. At once, the old-timers are reinvigorated and form up the barricades, jamming a long table against the ballroom doors and linking arms. Happy days are here again!

SEEN IN THE LITERATURE

Yu, C. (2017-11-02) **Formation of super-Earths by tidally-forced turbulence.** arXiv:1711.00594v1 [astro-ph.EP] preprint at www. arxiv.org

Author's abstract: *The Kepler* [space telescope] *observations indicate that many exoplanets are super-Earths, which brings about a puzzle for the core-accretion scenario. Since observed super-Earths are in the range of critical mass, they would accrete gas efficiently and become gas giants. Theoretically, super-Earths are predicted to be rare in the core-accretion framework.*

To resolve this contradiction, we propose that the tidally-forced turbulent diffusion may affect the heat transport inside the planet. Thermal feedback

induced by turbulent diffusion is investigated. We find that the tidally-forced turbulence would generate pseudo-adiabatic regions within radiative zones, which pushes the radiative-convective boundaries inwards. This would decrease the cooling luminosity and enhance the Kelvin-Helmholtz (KH) timescale.

For a given lifetime of protoplanetary disks (PPDs), there exists a critical threshold for the turbulent diffusivity, $V_{critical}$. If $V_{turb} > V_{critical}$, the KH timescale is longer than the disk lifetime and the planet would become a super-Earth rather than a gas giant. We find that even a small value of turbulent diffusion has influential effects on evolutions of super-Earths. $V_{critical}$ increases with the core mass.

We further ascertain that, within the minimum mass extrasolar nebula, $V_{critical}$ increases with the semi-major axis. This may explain the feature that super-Earths are common in inner PPD regions, while gas giants are common in the outer PPD regions. The predicted envelope mass fraction is not fully consistent with observations. We discuss physical processes, such as late core assembly and mass loss mechanisms, that may be operating during super-Earth formation.

Retallack, G.J. (2017) **The oldest known paleosol profiles on Earth: 3.46 Ga Panorama Formation, Western Australia.** PALAEOGEOGRAPHY, PALAEOCLIMATOLOGY, PALAEOECOLOGY 489:230-248

[Paleosols are fossilized soil layers, showing the topsoil, subsoil, and decayed bedrock underneath from which the soils originated.]

Author's abstract: *Subaerial volcanic flank and floodplain facies of the 3.46 gigayears-old Panorama Formation have been recognized on the basis of trough cross-bedded sandstones, lapilli tuffs, and abundant nodularized barite sand crystals, like those noted in other Archean non-marine facies. These barite-nodular layers are interpreted as alluvial paleosols for the following reasons.*

They show different degree of bedding disruption scaled to nodule size beneath a sharp upper boundary, like desert soil profiles. They show multiple generations of cracking, clay skins, and up-profile destruction of feldspar and rock fragments, compatible with weathering of labile constituents of the parent material. Loss of alkali and alkaline earth elements and phosphorus up profile are also features of chemical weathering.

Geochemical mass balance calculations (tau analysis) shows that the profiles lost mass and labile elements, unlike unaltered sediments and tuffs. Rare earth element analysis also shows light rare earth retention as in weathering, as opposed to sedimentation or hydrothermal alteration. Barite of nodules in the paleosols is mobilized to concentration under very acidic conditions (pH < 3) and is very stable under less acidic conditions.

These Archean alluvial paleosols may have formed by acid sulfate weathering by sulfuric acid, rather than the currently more common hydrolysis by carbonic acid. This archaic system of widespread acid sulfate weathering has since been marginalized to a few playa lakes, deep water tables, and sulfur springs.

Yeung, L.Y. (2017) **Low oxygen and argon in the Neoproterozoic atmosphere at 815 Ma.** EARTH AND PLANETARY SCIENCE LETTERS 480:66-74

Author's abstract: *The evolution of Earth's atmosphere on >10^6-yr timescales is tied to that of the deep Earth. Volcanic degassing, weathering, and burial of volatile elements regulates their abundance at the surface, setting a boundary condition for the biogeochemical cycles that modulate Earth's atmosphere and climate.*

The atmosphere expresses this interaction through its composition; however, direct measurements of the ancient atmosphere's composition more than a million years ago are notoriously difficult to obtain. Gases trapped in ancient minerals represent a potential archive of the ancient atmosphere, but their fidelity has not been thoroughly evaluated. Both trapping and preservation artifacts may be relevant.

Here, I use a multi-element approach to reanalyze recently collected fluid-inclusion data from halites purportedly containing snapshots of the ancient atmosphere as old as 815 Ma. I argue that those samples were affected by the concomitant trapping of air dissolved in brines and contaminations associated with modern air. These artifacts lead to an apparent excess in O_2 and Ar. The samples may also contain signals of mass-dependent fractionation and biogeochemical cycling within the fluid inclusions.

After consideration of these artifacts, this new analysis suggests that the Tonian atmosphere was likely low in O_2, containing less than or equal to 10% present atmospheric levels (PAL), not ~50% PAL as the data would suggest at face value. Low concentrations of O_2 are consistent with other geochemical constraints for this time period and further imply that the majority of Neoproterozoic atmospheric oxygenation occurred after 815 Ma. In addition, the analysis reveals a surprisingly low Tonian Ar inventory, =60% PAL, which, if accurate, challenges our understanding of the solid Earth's degassing history.

When placed in context with other empirical estimates of paleo-atmospheric Ar, the data imply a period of relatively slow atmospheric Ar accumulation in the Paleo- and Meso-Proterozoic, followed by extensive degassing in the late Neoproterozoic or early Cambrian, before returning to a relatively quiescent state by the Devonian. This two-step structure resembles that for the evolution of atmospheric O_2, hinting at a common driving force from the deep Earth.

Some caution is warranted, however, because still more enigmatic contaminations than the ones presented here may be relevant. Gases trapped in minerals may offer important constraints on the evolution of Earth's surface, climate, and atmosphere, but potential contaminations and other confounding factors need to be considered carefully before these records can be considered quantitative.

Roger, A.J., et al (2017) **The origin and diversification of mitochondria.** CURRENT BIOLOGY 27:R1177-R1192

Speirs: Mitochondria are organelles found in all eukaryotic cells, that is, cells with a nucleus. That means all multicellular animals such as us. They provide the essential oxygen respiration that our cells need. Without them we would be dead in seconds, and multicellular life would never have evolved beyond a few clumps of cells floating in seawater. It is now known that mitochondria were originally very primitive bacteria which formed a symbiotic relationship with the earliest multicellular organisms. The energy source that drives all life is adenosine triphosphate (ATP).

Authors' abstract: *All mitochondria derive from a common ancestral organelle that originated from the integration of an endosymbiotic alphaproteobacterium into a host cell related to Asgard Archaea. The transition from endosymbiotic bacterium to permanent organelle entailed amassive number of evolutionary changes including the origins of hundreds of new genes and a protein import system, insertion of membrane transporters, integration of metabolism and reproduction, genome reduction, endosymbiotic gene transfer, lateral gene transfer and the retargeting of proteins. These changes occurred incrementally as the endosymbiont and the host became integrated.*

Mitochondria are essential double-membrane bound subcellular compartments that are best known as the powerhouses that supply eukaryotes with energy in the form of ATP to serve their cellular needs. We are taught in introductory biology courses that mitochondria are the site of aerobic respiration, a complex biochemical process by which pyruvate is oxidized to CO2, generating reduced cofactors that drive the electron transport chain to chemiosmotically fuel ATP synthesis. The final electron acceptor for this process is oxygen, which is why the majority of eukaryotes require oxygen to survive.

Yet the last half a century of research into the mitochondria of a number of model system eukaryotes has revealed that these organelles do far more than just aerobic respiration. Indeed, mitochondrial proteomes typically consist of greater than 1,000 proteins that function in a wide variety of critically important biochemical processes including protein synthesis, amino acid and nucleotide metabolism, fatty-acid catabolism, lipid, quinone and steroid biosynthesis, iron-sulfur (Fe/S) cluster biogenesis, apoptosis, and ion homeostasis, to name a few.

The symbiont may have started out utilizing host metabolite resources as a mild parasite or the host and symbiont could have been syntrophic partners, but then, once the host had tapped the symbiont ATP supply, the association may have shifted to enslavement. Regardless of how these initial stages of the association played out, the autonomy of both the mitochondrial symbiont and the host cell were ultimately eroded through the progressive integration of both cells.

This merger was made possible, in large part, by the origin of the mitochondrial protein import apparatus that allowed host and symbiont compartments to mix genes and proteomes.

Although the precise environmental context and nature of the symbiotic association is not known for certain, it is clear that all proto-mitochondrion-containing proto-eukaryotes must have lived in close proximity to oxygen. Part, or all, of these organisms' lifecycles must have

required aerobic respiration, as these mitochondrial pathways are carried out by proteins with clear phylogenetic affinities to the pre-mitochondrial alphaproteobacterium.

Zhu, M., and X.H. Li (2017) **Introduction: from Snowball Earth to the Cambrian explosion: Evidence from China.** GEOLOGICAL MAGAZINE 154:1187-1192

Authors' abstract: *The Neoproterozoic to Palaeozoic transition (NPT) around 600 megayears ago was a critical time interval when the Earth experienced fundamental change, manifested as climatic extremes, Snowball Earth followed by the emergence and rapid diversification of animals in the Cambrian explosion.*

South China preserves a complete stratigraphic succession of the NPT developed in various facies ranging from shallow to deep marine realms with extraordinarily well-preserved, successive fossil biotas in various taphonomic settings, making it a key area and global focus of studies in the field over recent decades. Indeed, the current narrative of early animal evolution has largely been based on the fossil biotas from South China.

These include:
(1) the world's oldest microscopic animal fossils with cellular details from the early Ediacaran Weng'an biota (Doushantuo Formation);
(2) putative macroscopic animal fossils preserved as carbonaceous imprints from the early Ediacaran Lantian, Wenghui and Miaohe biotas (also Doushantuo Formation);
(3) typical late Ediacaran faunas, preserved in dark limestone (Shibantan biota) and as large and poorly mineralized tubular animal fossils (Gaojiashan biota), both from the Dengying Formation;
(4) phosphatized small shelly and soft-bodied animal fossils from the early Cambrian Meishucun and Kuanchuanpu faunas; and
(5) Cambrian fossil Lagerstätten (Chengjiang, Guanshan and Kaili faunas) with typical Burgess Shale-type soft-bodied preservation.

Luo, C., et al (2017) **Chambered structures from the Ediacaran Dengying Formation, Yunnan, China: comparison with the Cryogenian analogues and their microbial interpretation.** GEOLOGICAL MAGAZINE 154:1269-1284

Authors' abstract: *Enigmatic chambered structures have been reported forming reef frames in Cryogenian interglacial carbonates, prior to the commonly acknowledged microbial-metazoan reefs at the terminal Ediacaran, and interpreted as fossils of possible sponge-grade organisms. A better constraint on the affinity of these structures is partly hindered by few analogues in other time periods.*

This study describes similar structures from peritidal dolostones of the Ediacaran Denying Formation from Yunnan, China. Samples were investigated using optical microscopy and three-dimensional reconstruction based on grinding tomography.

The Dengying chambered structures are comparable with Cryogenian structures in basic construction, but are not frame building, and show variations in overall shape and inhabiting facies. Two-dimensional cross-sections show that thin, homogeneous micritic laminae are the basic building blocks of the chamber walls. Thick walls represent parallel accretion of these laminae, and thin walls developed from the angular growth of a single lamina or merging of multiple laminae.

In 3-D space, the laminae primarily correspond to continuous surfaces which sometimes contain sub-circular holes, while a few represent filamentous elements connected to the surfaces. The morphological features and growth pattern of the Dengying chambered structures indicate that they are likely to be calcified microbial constructions rather than skeletal remains of basic metazoans. However, aside from the Cryogenian and Dengying examples, comparable chambered constructions with laminae-based architecture are yet unknown from other fossil or extant microbialites.

Speirs: Before corals began forming reefs, there were these, but what were they? They didn't just deposit calcium carbonate in solid masses, but formed chambers like coral animals yet were microbes.

Stinnesbeck, W., et al (2017) **Hells Bells: unique speleothems from the Yucatán Peninsula, Mexico, generated under highly specific subaquatic conditions.** PALAEOGEOGRAPHY, PALAEOCLIMATOLOGY, PALAEOECOLOGY 489:209-229

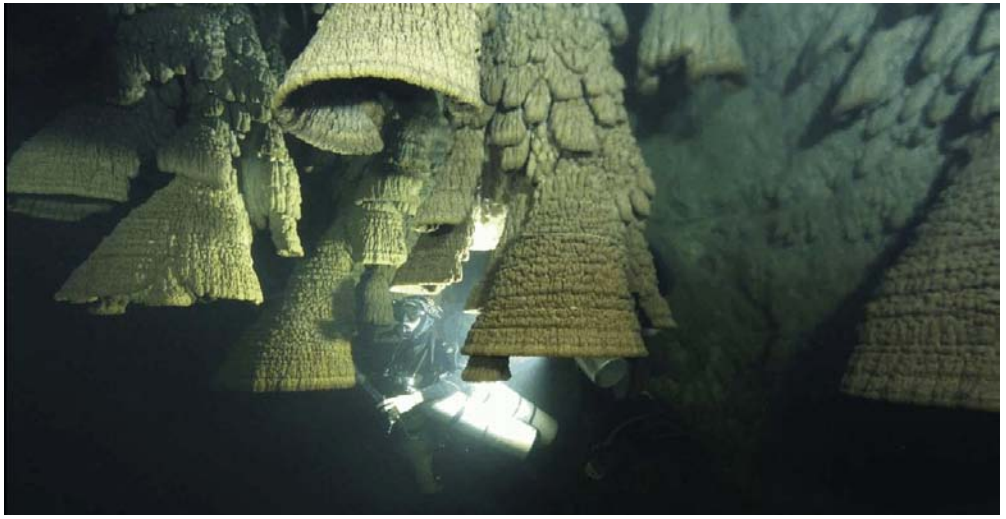
Authors' abstract: *We here report on a type of meter-sized pendant speleothem growing under water in the submerged El Zapote sinkhole (cenote) west of Puerto Morelos on the Mexican Yucatán Peninsula. These conical, mantle-shaped downward expanding and diverging calcareous structures, here termed as Hells Bells, are yet unreported in the scientific literature.*

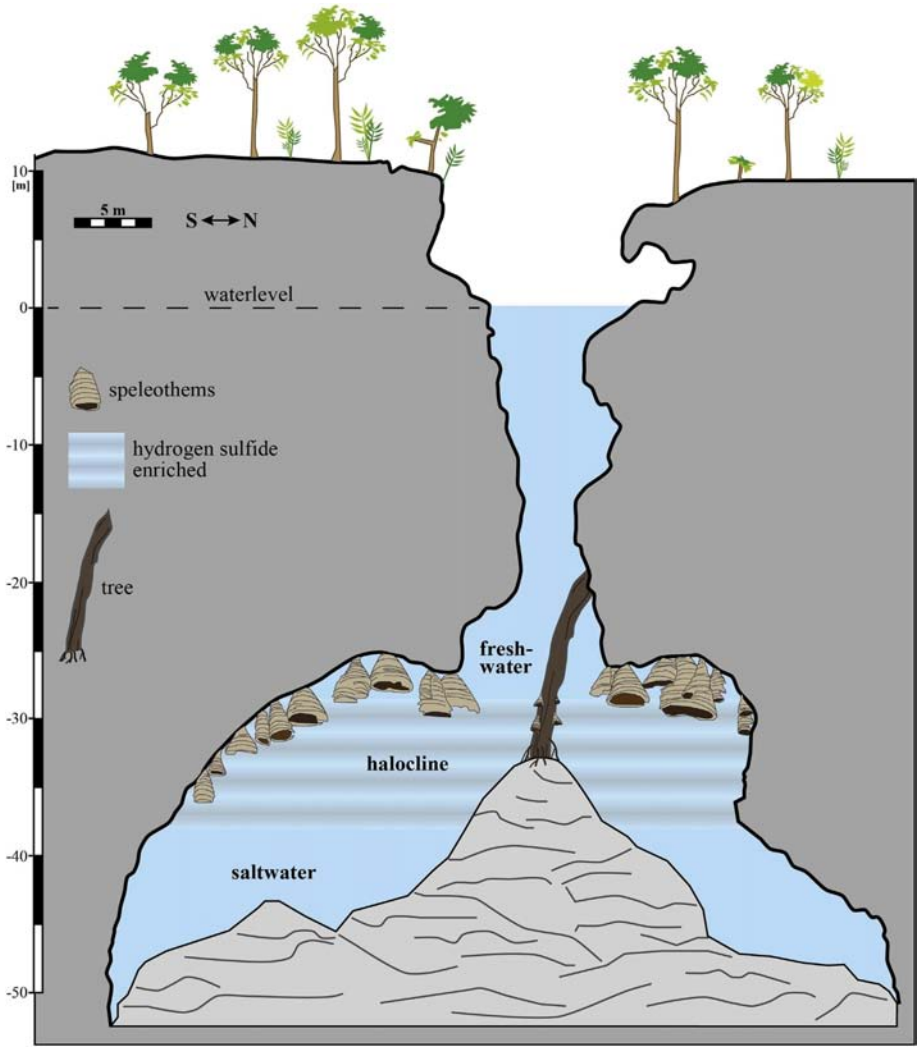
They are characterized by bell- or trumpet shaped longitudinal and circular, elliptical or horse-shoe-like horizontal cross-sections. Hells Bells grow downward, based on the downward divergence of the structures and the horizontally laminated internal texture of both blade-shaped spar calcite and microspar laminae.

Age dating confirms that Hells Bells are young (<4500 yr) and formed in a subaquatic environment. They grow under lightless conditions in a stratified water body, which is characterized by a fresh water body overlying a salt water body with a stagnant transition zone (halocline) of several meters.

We hypothesize that the growth of these structures is mediated by specific physical and biogeochemical conditions above and in the halocline. Stagnant hydraulic conditions led to extensive diffusion profiles of several nutrients including calcium originating from the salt water body. Dissolved organic carbon from the fresh water is microbially oxidized in the upper part of the halocline, where a distinct redox zonation was identified from oxic to anoxic conditions. Degradation processes combined with slightly alkaline pH values as well as the diffusive transport of calcium into this zone may induce an increase in calcite oversaturation.

Phylogenetic analysis of the community on the surface of the Hells Bells suggests the presence of microorganisms involved in the nitrogen-cycle, from which some potentially have the capability to increase the pH by autotrophic growth and denitrifying activity, thus supporting calcite precipitation. The growth of Hells Bells is strictly dependent on the elevation of the halocline. This offers a wide potential for the use of Hells Bells as archives of paleo-hydrological conditions during the Holocene, e.g. the variation of thickness of the fresh water lens on the Yucatán Peninsula.





Hardigan, M.A., et al (2017) **Genome diversity of tuber-bearing Solanum uncovers complex evolutionary history and targets of domestication in the cultivated potato.** PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES USA 114:E9999-E10008

Authors' abstract: *Worldwide, potato is the third most important crop grown for direct human consumption, but breeders have struggled to produce new varieties that outperform those released over a century ago, as evidenced by the most widely grown North American cultivar (Russet Burbank) released in 1876. Despite its importance, potato genetic diversity at the whole-genome level remains largely unexplored.*

Cultivated potatoes (Solanum tuberosum L.), domesticated from wild Solanum species native to the Andes of southern Peru, possess a diverse gene pool representing more than 100 tuber-bearing relatives (Solanum section Petota). A diversity panel of wild species, landraces, and cultivars was sequenced to assess genetic variation within tuber-bearing Solanum and the impact of domestication on genome diversity and identify key loci selected for cultivation in North and South America.

[Polyploidy refers to duplicate sets of chromosomes, which provide more vigour. For example, a diploid has two sets of chromosomes and tetraploids have four sets. Introgressions are genes absorbed from other species after hybridization.]

Sequence diversity of diploid and tetraploid S. tuberosum exceeded any crop resequencing study to date, in part due to expanded wild introgressions following polyploidy that captured alleles outside of their geographic origin.

We identified 2,622 genes as under selection, with only 14 to 16% shared by North American and Andean cultivars, showing that a limited gene set drove early improvement of cultivated potato, while adaptation of upland (S. tuberosum group Andigena) and lowland (S. tuberosum groups Chilotanum and Tuberosum) populations targeted distinct loci. Signatures of selection were uncovered in genes controlling carbohydrate metabolism, glycoalkaloid biosynthesis, the shikimate pathway, the cell cycle, and circadian rhythm.

Reduced sexual fertility that accompanied the shift to asexual reproduction in cultivars was reflected by signatures of selection in genes regulating pollen development/gametogenesis. Exploration of haplotype diversity at potato's maturity locus (StCDF1) revealed introgression of truncated alleles from wild species, particularly S. microdontum in long-day adapted cultivars. T his study uncovers a historic role of wild Solanum species in the diversification of long-day adapted tetraploid potatoes, showing that extant natural populations represent an essential source of untapped adaptive potential.

Forgan, D.H., R. Heller, and M. Hippke (2017-10-30) **Photogravimagnetic assists of light sails: a mixed blessing for Breakthrough Starshot?** arXiv:1711.05856v1 [astro-ph.IM] Preprint at www.arxiv.org

Authors' abstract: *Upon entering a star system, light sails are subject to both gravitational forces and radiation pressure, and can use both in concert to modify their trajectory. Moreover, stars possess significant magnetic fields, and if the sail is in any way charged, it will feel the Lorentz force also.*

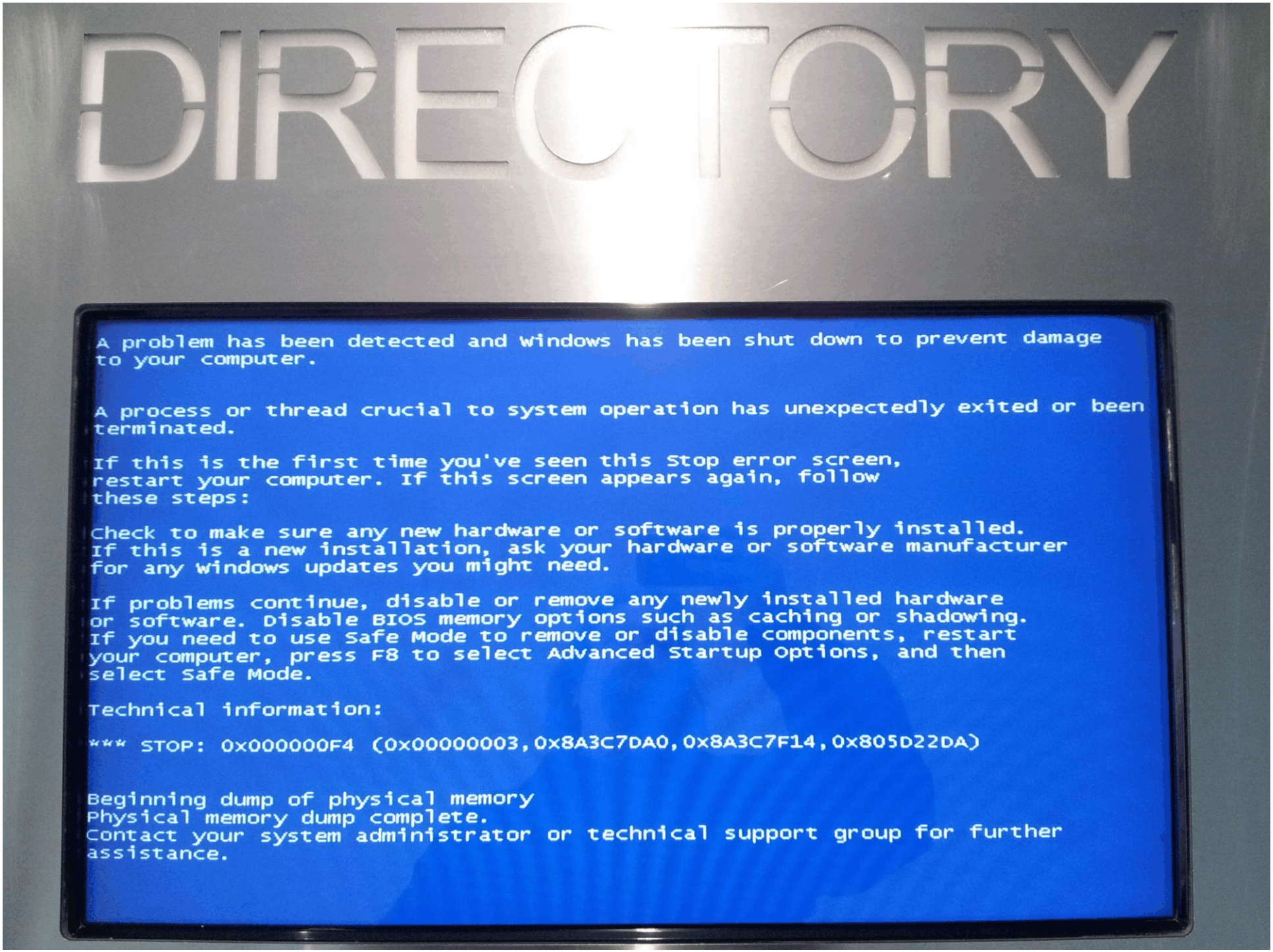
We investigate the dynamics of so-called photogravimagnetic assists of sailcraft around Alpha Centauri A, a potential first destination en route to Proxima Centauri (the goal of the Breakthrough Starshot program). We find that a $10m^2$ sail with a charge-to-mass-ratio of around 10 microC/g or higher will need to take account of magnetic field effects during orbital maneouvres.

The magnetic field can provide an extra source of deceleration and deflection, and allow capture onto closer orbits around a target star. However, fiipping the sign of the sailcraft's charge can radically change resulting trajectories, resulting in complex loop-de-loops around magnetic field lines and essentially random ejection from the star system. Even on well-behaved trajectories, the field can generate off-axis deflections at Alpha Centauri that, while minor, can result in very poor targeting of the final destination (Proxima) post-assist.

Fortunately for Breakthrough Starshot, nanosails are less prone to charging en route than their heavier counterparts, but can still accrue relatively high charge at both the origin and destination, when traveling at low speeds. Photogravimagnetic assists are highly non-trivial, and require careful course correction to mitigate against unwanted changes in trajectory.

SIGNS, SIGNS, EVERYWHERE A SIGN
photos by Dale Speirs

Skyscrapers such as this one, Fifth and Fifth, in downtown Calgary, use computer screens for their office directories. But we've all had problems with software updates, haven't we?



At the When Words Collide convention earlier this summer, the Delta South Hotel was renovating and put this temporary sign up on the men's washroom. I didn't dare go over to the women's washroom for fear of being arrested when taking a smartphone photo, so I don't know what their washroom sign looked like.

Below: I was visiting the town of Cochrane en route to the mountains earlier this year and stopped off at a retail postal outlet in Rexall Drugs. Do as we say, not as we do.