
OPUNTIA 584

Thanksgiving 2024

Opuntia is published by Dale Speirs, Calgary, Alberta. It is posted on www.efanzines.com and www.fanac.org. There is also an cumulative subject index to all issues available at those sites. 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.

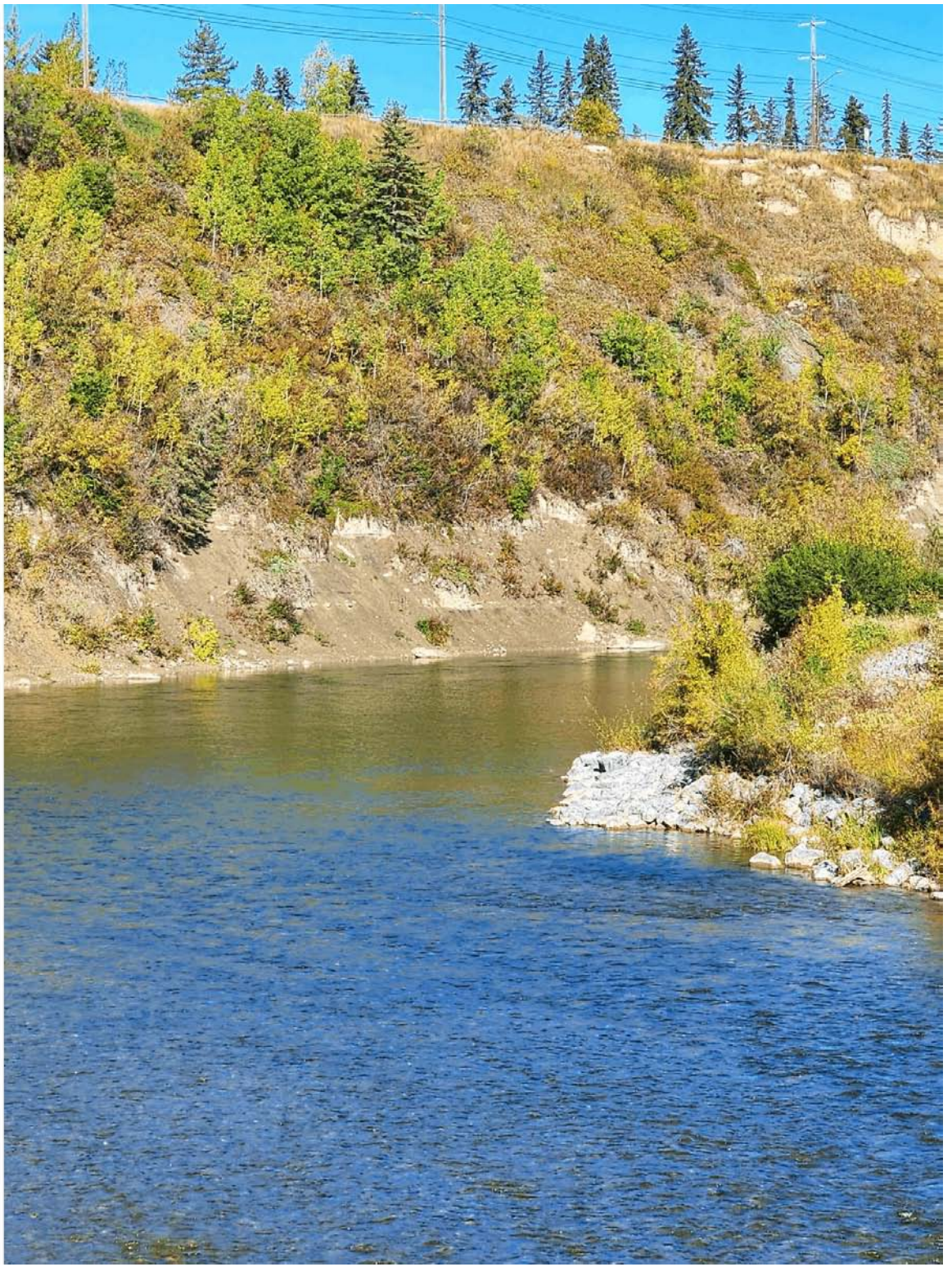
ELBOW RIVER CANYON

photos by Dale Speirs

The Elbow River meanders from the adjacent Rocky Mountains through the city of Calgary before emptying into the Bow River. The junction was where Fort Calgary was originally established. The river got its name from its numerous right-angle bends.

A few kilometres upstream from the junction the river carved a canyon. Chez Opuntia is a brief walk from the canyon and several times a year I like to mosey on over and admire the view. In the autumn the water is shallow and crystal clear.

The photo at right was taken from the pedestrian bridge shown on the cover, looking downstream.



The photo at left was taken from the bridge looking upstream, and the photo below is a cross-wise shot from the bank.

This section of the river is known as Sandy Beach despite the fact that all the beaches are gravel. In the 1930s, the Glenmore Reservoir was constructed just upstream, cutting off the deposits of sand, which now accumulate in the reservoir.

WHERE HAVE ALL THE LIFESAVERS GONE?
by Dale Speirs

Calgary has a dry climate, indoors and outside. Outside, the dry season is August to early October. Once winter sets in and the furnace begins running steadily, the air inside is dry all winter long from November to April.

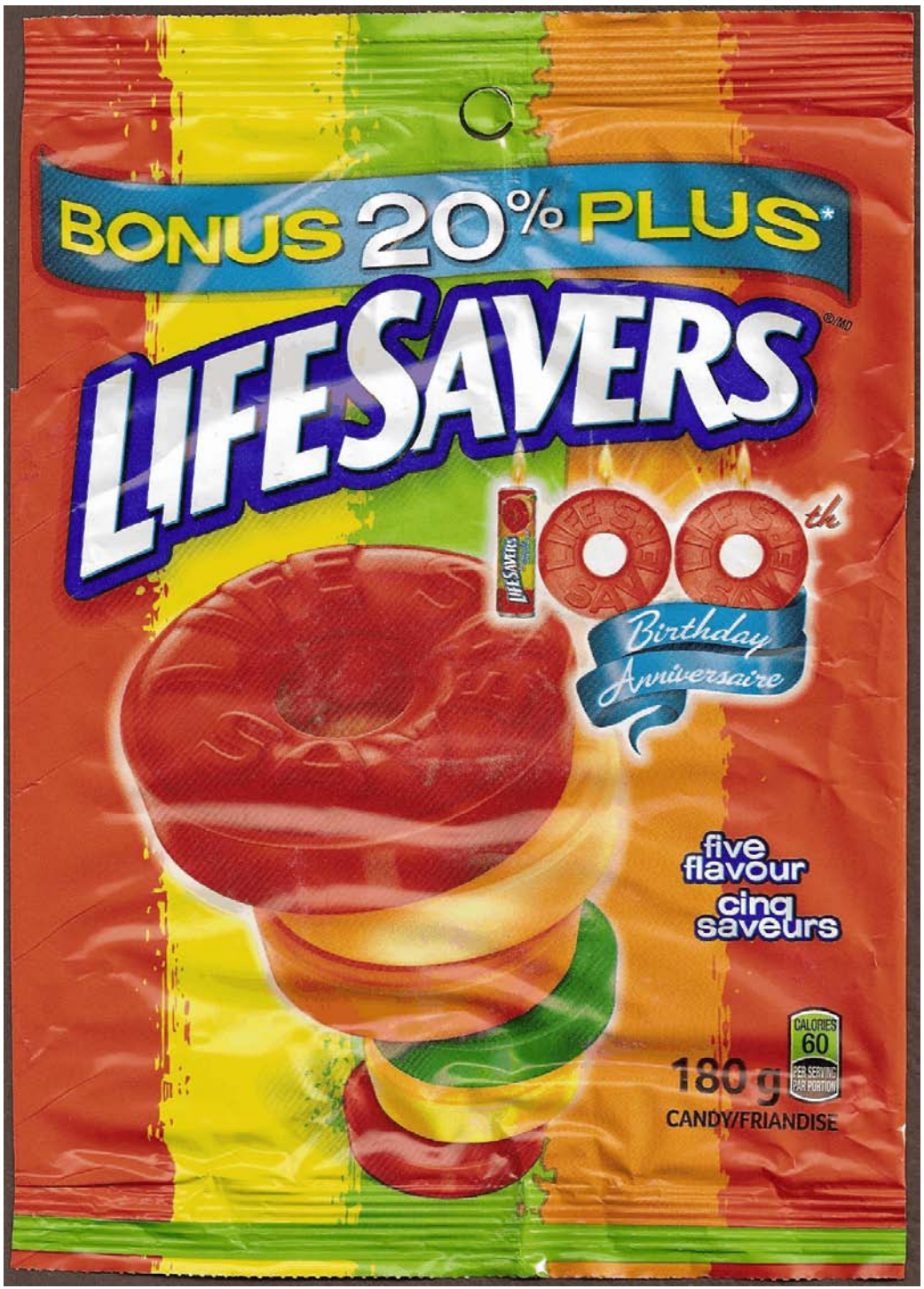
As a result, I consume quite a few hard candies and cough lozenges to keep my throat moist. My preference was for bulk 150-gramme Lifesaver bags as being cheaper and tastier. Rolls of Livesavers are expensive.

Over the past decade, bags of Lifesavers have been gradually disappearing from Calgary supermarkets and drug stores. The brand still exists as bags of gummies but the only hard candy is peppermint. My favourite has always been Five Flavours, still available in rolls (below) but no longer as bags (right).

Now they are gone and I have to order online. Amazon has them and for that matter, other obsolete items not available in Calgary stores. I get my electric razor blade replacements from Amazon, not wanting to buy a new shaver when the old one works just as well. Likewise computer printer cartridges for my HP LaserJet 5, still going strong since I bought it in 1998.

Wrapper from a roll.

Can't get these anymore, alas. And yes, I like to scan food items.



This was a limited-edition package sold in 2012 during Lifesavers' centennial.

The only Amazon Lifesaver supplier who will ship to Canada has the bags in the 50-ounce size, or 1,475 grammes, enough to feed my habit for a while.

THANKSGIVING FICTION: PART 3
by Dale Speirs

[Parts 1 to 2 appeared in OPUNTIAs #484 and 535.]

Gimme That Old Time Radio.

THE ADVENTURES OF SAM SPADE, based on the character created by Dashiell Hammett, aired from 1946 to 1951. It went off the air shortly after both Hammett and Howard Duff, the actor who played Sam Spade, were named as Communist sympathizers during the Red Scare.

Spade worked in San Francisco. His secretary was Effie Perrine, a scatterbrained young woman who took down his narration in the form of a report. Each episode began with Spade telephoning Effie and telling her to rush down to the office to meet him there so he could dictate a report on the case he had just solved.

"The Terrified Turkey Caper" aired on 1950-11-24 and was written by Larry Roman and John Michael Hayes. Note that the airdate was the day after the American Thanksgiving.

The client was a nervous man who initially had to convince Sam Spade that his name really was Thomas Turkey. Someone was trying to kill him. He had previously gone to another private detective Al Koocho, who laughed at him and referred him to Spade.

After the initial alarums, the investigation became confusing. Spade checked a reference who described Turkey exactly but said he had been dead for years. Locating the existing Turkey provided an explanation. He had staged his suicide then went traveling for seven years. Spade told him to wait in his apartment while he checked the story.

There was a wife Henrietta, who had received Tom's letter that he was back in town. The missive coincided with the attempts of Tom's life. She denied receiving the letter. Returning to his apartment, he found the police forensics team but the body was Koocho. There was no sign of Tom.

A person missing seven years can be declared dead by the courts, which suggested something to Spade and the listeners. A Big Ugly Guy calling himself Captain John Smith barged into Spade's office and began shooting. Spade was going to be around a while longer, so he survived.

The next visitor was dressed like a pilgrim and carrying a blunderbuss. He escorted Spade to a soup kitchen where Tom Turkey was supping. The obvious plot coupon was confirmed when Tom said that Henrietta had a $50,000 life insurance policy on him. Call it $500,000 in today's depreciated currency.

Spade told Tom to telephone Henrietta, which he did. She told him she would come over but the limousine that pulled up to the mission contained her lawyer and Capt. Smith. There was a fracas which Spade won by borrowing the blunderbuss from the Pilgrim.

The lawyer had, unbeknownst to Henrietta, kept up payments on Tom's life insurance. When he was declared dead after seven years, the lawyer would collect on the policy without telling Henrietta.

Cozy Thanksgiving.

TURKEYS AND THANKSGIVING (2020) by Leena Clover was a large-print cozy mystery chapbook. An unusual format since cozies are usually novels. This one was part of a series of novels about Jenny King of Pelican Cove, Virginia. She worked in the Boardwalk Café when not Marpleing.

Jenny was hired by Harrison Webster, the Prince of Poultry, to find his missing pet turkey. The police wouldn't take him seriously. The bird was named, not very originally, Turkey Tom.

Harrison had been a major poultry producer until a virus destroyed his flock many years ago. Now he just puttered about and raised a few turkeys in his back yard. His grandson Matt resented the attention the turkeys got.

Jenny was reluctant to take the case. Thanksgiving was a busy time for the café. There were whiskey-soaked pumpkin pies to be baked. The crab omelettes were very popular.

A local group of biddies planned a turkey bake-off for Thanksgiving Day. For residents this seemed nonsensical because most people would be at home with their own meals. Jenny was talked into judging the contest.

While the townsfolk basted their birds, Jenny visited Harrison's former partner. He advised her that the missing bird was a direct pedigreed descendent of the Puritan birds, wherein lay Turkey Tom's real value. Modern breeds are more productive but there are always those who pay more for so-called artisanal turkeys.

The big day arrived and there was a good turnout for the bake-off. The $1,000 prize undoubtedly helped boost attendance. The ending was a tomato surprise. The winner of the contest appeared from nowhere with a unanimous judgement that his artisanal bird was perfect.

The bird was the late great Turkey Tom, kidnapped by Matt in a jealous rage and turned over to his friend for the contest. The Deppity Dawg made an arrest for theft. Jenny had no confrontation. For once, Miss Marple let the police do their job.

A GOOD DOG'S GUIDE TO MURDER (2022) by Krista Davis was the eighth novel in a cozy series about Holly Miller of Wagtail, Virginia. She operated a pet-friendly resort hotel. Thanksgiving was nigh and there was no room at the inn.

One of the activities was the Dog and Cat Gingerbread House Contest at the convention centre. As to how a village could afford a convention centre, the answer was that the land had been endowed by the late Orly Biffle.

On the landscape was an old oak tree, which collapsed as the story began. A bulldozer was brought in to remove the remains. It uncovered a concrete-filled interior in the tree trunk. This was a standard arbouricultural practice to reinforce trunks hollowed out by wood rot and keep the tree going.

Unfortunately the trunk had been filled with more than concrete. The body of a man was embedded inside. The village was subsequently flooded with a second set of visitors, those who had a missing relative from decades ago.

Holly investigated, as did the police. She had assistance from her dog Trixie and cat Twinkletoes. Unlike the police, she had to prepare Thanksgiving dinners for hotel guests and her family. She used the family reunion to scrape up back stories about the deceased, which soon led to back stories about her own family.

Assorted alarums occurred, such as a child kidnapping and poisoned cookies. In the denouement, both the killer and the victim were identified. Orly had been a suspect but the murderer was in fact still extant. Lots of romantic entanglements from the past were identified, one of which had led to the original murder.

Everyone having digested their turkey, the following day saw a plethora of leftover turkey sandwiches. The novel moved on to the recipes appendix. Read it very carefully because recipes are included for both humans and dogs.

I don't own a dog, so I'll just mention the human-edible recipes, which began with Maple Latte. Then on to Pumpkin French Toast, Carrot Pumpkin Soup, Apple Cider Cocktail, and Gingerbread Cookies. What, no turkey leftovers?

WHEN WORDS COLLIDE 2025

Calgary's annual readercon When Words Collide has a membership limit of 1,000 plus volunteers and guests. The event always sells out a few months before. Reports of previous WWC conventions appeared in OPUNTIAs #71, 253, 266, 282, 318, 350, 387, 421, 452, 481, 507, 532, 555, and 580.

The 2025 WWC will be held August 15 to 17 at a new location, the Sheraton Cavalier Hotel, 2620 - 32 Avenue NE. The Alexandra Writers Centre in Calgary are the organizers. They did a good job in 2024 and will no doubt do so again in 2025. Details from www.whenwordscollide.org

Numerous authors, editors, and publishers will be in attendance. The dealer bourse is restricted to books. The average customer buys in armloads or tote bags full.

GUTENBERG OLDIES
by Dale Speirs

Project Gutenberg (https://gutenberg.org) offers tens of thousands of public-domain books as free downloads. I check their new listings regularly and noticed that recently a number of mystery novels have been appearing. These were at best mid-list books back in their day and were since forgotten.

However some are worth reading again, perhaps only once and then deleted. If nothing else, their textual styles illustrate how much novel writing has changed over the past century. The reader should note this well, as older books cannot be judged by today's standard.

PHILO GUBB, CORRESPONDENCE-SCHOOL DETECTIVE (1918) by Ellis Parker Butler was a fix-up novel. The chapters were originally published as short stories. The theme was about a paperhanger setting himself up in the detective business via the Rising Sun Detective Agency Correspondence School of Detecting. There's more to life than hanging wallpaper all day.

In the first story, Gubb's roommate Mr Critz was also thinking about a change in lifestyle and becoming a confidence man. He had trouble learning the shell game because the pea kept rolling off the table before he could palm it.

As matters transpired, Critz really was a con man, known to police as the Hard Boiled Egg. A friend tipped off Gubb after Critz tried the gold brick scam. Gubb invited the constabulary in, and thereafter Critz would be sharing a cell, not a room.

There followed more episodes where Gubb would inadvertently solve a different crime than the one he was working on. Generally he was the idiot in an idiot plot. Trying to read the book straight through was tiresome, especially the sho-nuff dialect. The reader is advised to read a story at a time, then set the book aside for a day or two.

THE BROOKLYN MURDERS by G.D.H. Cole (1924) was not about the American city but Sir Vernon Brooklyn of Britain. He owned a chain of theatres and touring companies.

Sir Vernon wanted his step-niece Joan Cowper to marry his nephew John Prinsep. She was adamant that she would not. The matter was settled at the beginning of Chapter 3 when John was stabbed to death in his quarters. Surprisingly the victim wasn't Sir Vernon, a grouchy old tyrant who ruled the Brooklyn family or tried to.

There were plenty of suspects. Joan of course, but Sir Vernon's wastrel brother Walter, stepfather of Joan, was always in serious debt. His financial accounts were being audited by John.

George Brooklyn was Sir Vernon's other nephew and John's cousin. They didn't get along. He was the last person who visited John before the murder was discovered.

George was eliminated in the next chapter when Joan found his body in the garden, his head bashed in. Scotland Yard Inspector Blaikie had his hands full. The problem was that the evidence indicated John had been murdered in his study by George and George was murdered in the garden by John.

Walter became the leading suspect. Joan did some Marpleing to help her stepfather. The police arrested Walter but began to have their doubts as some of the evidence frayed. The novel became cluttered with checklists, timetables, and maps as various sleuths tried to work out the events. The butler Winter was suspected of doing the murders.

Walter was released. Sir Vernon had fallen ill and was not expected to live. Walter and his cousin Carter Woodman discussed the will and which of them would benefit. The two men were both deeply in debt and trying to raise cash to stay ahead of their creditors.

Joan and her boyfriend confronted the killer, who had hoped to profit from Sir Vernon's will. Alas, the old geezer rose from his sickbed and changed his will to exclude the murderer. That being the case, he blew his brains out. A good way to finish up a denouement.

My next Gutenberg download was MURDER IN THE MAZE (1927) by J.J. Connington. The first chapter set up the characters out on their family estate in England.

Twin brothers Roger and Neville Shandon were each successful in their own way, and supported a younger weakling brother Ernest. By a deceased sister, they had a niece Vera Hawkhurst and her layabout brother Arthur.

Roger didn't survive past Chapter 2. In his past life he had made his money in South Africa and South America by means he didn't care to discuss. The family estate had a maze where he met his end at the hands of someone who had the worst kind of grudge against him.

Possibly a business partner from the old days, or Arthur, who had been told by Roger in the first chapter that he would be cut off if he didn't go out and find a job. Possibly Ernest, who was tolerated and resented the condescension immensely.

Then Neville's body was found at another spot in the maze. He was a barrister, currently prosecuting a hard case named Hackleton who could see the prison gate closing on him. Hackleton might have sent agents to kill Neville.

The brothers were both killed by poison darts fired from an air gun. The murderer had cut and camouflaged loopholes in the maze at ground level. Those allowed him get the brothers and then escape by a direct route.

The police detective sorted through the clues. Attempts were made on the Hawkhurst siblings, and Ernest reported an attack on himself. The police closed in step by plodding step.

Ernest was identified as the culprit, hoping to inherit the estate. He was trapped by the police inside the maze as he fled. They let him carry a handgun, then drove him to shoot himself. The suicide could be attributed to stress about losing his brothers, not fear of the noose. That would save family honour. Justice can be served outside the courts.

THE CHEYNE MYSTERY (1926) by Freeman Wills Crofts was a novel part of a series about Inspector Joseph French. The protagonist was Maxwell Cheyne, a gentleman of leisure if not that much wealth.

Among other things, he dabbled as an author of short stories although not earning a full living. He lived with his mother, who had a small inheritance. He was approached by Hubert Parkes with a proposal to collaborate in their writing.

Parkes drugged Cheyne unconscious in a restaurant and then casually walked out. Not robbery, and he even paid the check on the way out. Returning home, Cheyne found the house had been burgled but nothing taken. He hired a private detective who was unable to do anything.

Subsequently Cheyne was kidnapped and the motive finally revealed. He had some papers a friend named Arnold Price had entrusted to him. Someone wanted them.

Cheyne eventually got free but instead of contacting police he decided to play the amateur sleuth. Since the author's day job was with a railway engineer, there was a lot of action on the tracks and much detail about train schedules.

They had reached Exeter at 5:02 P.M. Two expresses left the station shortly after, the 5:25 for Liverpool, Manchester and the north, and the 5:42 for London. Cheyne sat down on a deserted seat near the end of the platform and bent his head over his notebook while he watched the others.

Cheyne discovered his housemaid was part of the gang. Assorted alarums followed, not all on trains. Eventually Inspector French came into the case. Ultimately the denouement came to a freighter carrying £2.5 million of gold in 1917, which, if I did my calculations correctly, would be about 9 tons of ingots. The gold would be worth billions today.

The ship was sunk by U-boats. Price's paper had the location and the gang wanted to salvage the gold. They did, after which the Royal Navy and the police relieved them of their loot.

The novel bogged down in a morass of details and conspiracies, which explained why the author is seldom read today. The plot was too dense with details.

"The Gallery Gods" by Murray Leinster (1920-08-21, ARGOSY ALL STORY WEEKLY) was about William Beckwith, on the lam in Bolivia from the law. He had murdered a New York City millionaire (today, read as billionaire) Hugh Conway.

Beckwith left a note pinned to the deceased bragging about his perfect crime. He relied on there being no extradition treaty plus the bribes he had paid to the generalissimo to keep himself safe.

He had all the newspapers sent to him from the city and was indignant when none of them mentioned the crime. Conway had been a prominent financier and socialite, so his murder should have dominated the front pages.

About a month later, the newspapers began reporting Conway's philanthropic and social affairs. Beckwith was beside himself. There was nothing for it but to book passage home and find out the truth.

The NYPD met him at the dock. They had convinced the newspapers to not only remain silent about the murder but to run fake news about Conway. Beckwith was quite right that he couldn't be touched in Bolivia, so the police flushed him out with their plan.

ZINE LISTINGS

[I only list zines I receive from the Papernet. If the zine is posted on www.efanzines.com or www.fanac.org, then I don't mention it since you can read it directly.]

CHRISTIAN NEW AGE QUARTERLY V26#3+ (US$5 from Catherine Groves, Box 276, Clifton, New Jersey 07015-0276) The articles are difficult to summarize in one or two sentences. The theme was, more or less, religious metaphors, in one instance interpreted using an episode of Star Trek: TNG.

THE FOSSIL #401 (US$10 from The Fossils, c/o Tom Parson, 157 South Logan Street, Denver, Colorado 80209) Devoted to the history of zinedom, with news about amateur press associations.

The main historical article was about an early apa zinester from the 1880s named Zebuline Adelaide Hunt. She made the national news with an extremely messy divorce which included child abduction and bigamy.

FOR THE CLERISY #95 (The Usual from Brant Kresovich, Box 404, Getzville, New York 14068-0404) Book reviews, mostly of older tomes such as the first Lew Archer private detective story, a novel about a convenience store clerk, and an 1859 novel THE WOMAN IN WHITE, considered as one of the earliest mysteries published.

Also there is BAD BLOOD, true crime about convicted fraudster Elizabeth Holmes, who sold a fake quick-test blood sampler. Her father was an Enron executive, so she learned from him. Now doing hard time.

FREE STUFF ONLINE

I provide sources for the scientific pdfs and old-time radio mp3s reviewed in this zine. Here is a summary of some good resources, all of which are free.

In particular, the "Seen In The Literature" column cites only peer-reviewed papers. For topics such as climate change or social media effects, more people should be reading these papers instead of blogs where commentators confuse their opinions as being facts.

For scientific papers I cite for which free pdfs are available, the easiest method is to Google either the title of the paper or its digital object identifier, the phrase beginning with doi.org.

Many papers are behind a paywall, so unless you have access to a university library computer, you can only get the abstract. However, the abstract is often enough to understand the gist of the article.

Every scientific periodical has free email notifications of each new issue's table of contents. I subscribe to dozens of notification services, in case you were wondering how I manage to keep up with the literature.

For zines, www.efanzines.com provides current pdf zines as well as some older ones. A club called Fanac at www.fanac.org does the reverse; they provide thousands of old zines from the 1930s to date, with a few current zines. Both sites have a free email notification service you can subscribe to.

The Old Time Radio Researchers have 90,000+ old-time radio shows (1930s to 1950s) covering all the genres, such as comedy, science fiction, fantasy, and mystery. Visit www.otrr.org/OTRRLibrary.

They also publish a free bulletin OLD RADIO TIMES, available at www.otrr.org/?c=times, with an email notification service. Don't pay money for audio books and listen to a droning voice when you can listen for free to full-cast shows such as Jack Benny or Inner Sanctum from the OTRR.

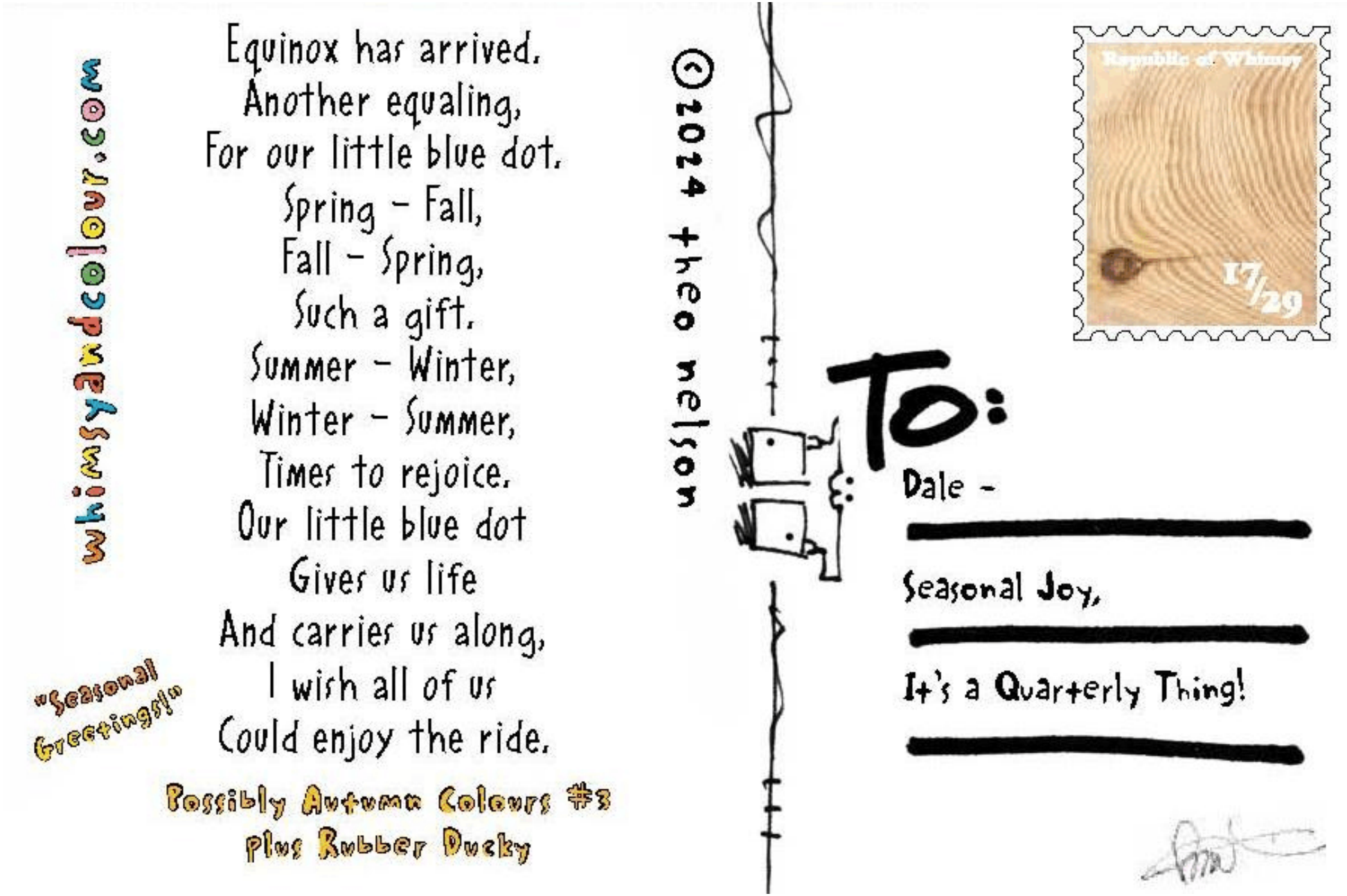
For pulp fiction magazines from all genres, visit www.archive.org/details/pulpmagazinearchive?&sort=-downloads&page=2
Books in the public domain are free from https://gutenberg.org

LETTERS TO THE EDITOR

[Editor's remarks in square brackets. Please include your name and town when sending a comment. Email to opuntia57@hotmail.com]

FROM: Theo Nelson 2024-10-06
Calgary, Alberta

[Through my carelessness, I missed getting two of Theo's quarterly mail art postcards earlier this year, but have now remedied the situation. The postcard below (message side) and on the next page (view side) should have been in the previous issue but better late than never. Thanks as always, Theo!]



FROM: Lloyd Penney 2024-10-10
Etobicoke, Ontario

OPUNTIA #583: The lights fixtures for the Night Light Festival remind me of the Nuit Blanche festival held here. At least your festival goes on for three days. The Nuit Blanche is only one night, and all is done the next morning. It was on this past weekend. We just can't pull all-nighters anymore, so we will probably never see a Nuit Blanche again.

[In Calgary, one suspects that any festival will be two or more days to amortize the cost of set-up and teardown.]

Thank you for the review of the stories in AMAZING STORIES BEST OF 2023. We did receive a lot of great stories, and we are still publishing on the website those stories. Some of them will doubtless make it into the Best of 2024 book, and we are working on that book right now, in addition to some other books.

The CBC keeps their radio dramas under lock and key? You'd think something like that could be available through their Gem website for all to enjoy whenever. I think Can*con is coming up in a few weeks, so when it happens, I will come up with some questions to ask of them with the possibility of coming up in 2025.

[Please do. There are thousands of old-time radio episodes locked away in the CBC vaults which should be available as mp3s, hopefully free.]

I keep hearing that SFWA is having the same kind of internal upheavals that other writers' associations have been having. I think they are definitely having some management problems, and I will see what happens to it before I invest any membership money.

[I don't belong to any writers organizations since I don't publish fiction. If I were to join any, the only candidate would be the Authors Guild, since they have resources and legal punch. SFWA, RWA, and all the others seem more like social clubs, with little effect on publishers or Internet fraudsters.]

SEEN IN THE LITERATURE

Planets.

Hernández, J.I.G., et al (2024) **A sub-Earth-mass planet orbiting Barnard's star.** ASTRONOMY AND ASTROPHYSICS 690:doi.org/10.1051/0004-6361/202451311 (available as a free pdf)

[Barnard's Star is the second closest star to the Sun, after Alpha Centauri.]

Authors' abstract: *Our analysis of ESPRESSO data using Gaussian process (GP) to model stellar activity suggests a long-term activity cycle at 3200 days and confirms stellar activity due to rotation at 140 days as the dominant source of radial velocity (RV) variations.*

These results are in agreement with findings based on publicly available HARPS, HARPS-N, and CARMENES data. ESPRESSO RVs do not support the existence of the previously reported candidate planet at 233 days.

After subtracting the GP model, ESPRESSO RVs reveal several short-period candidate planet signals at periods of 3.15 days, 4.12 days, 2.34 days, and 6.74 days.

We confirm the 3.15 days signal as a sub-Earth mass planet, leading to a planet minimum mass mp sin i of 0.37 ± 0.05 Earth masses, which is about three times the mass of Mars.

ESPRESSO RVs suggest the possible existence of a candidate system with four sub-Earth mass planets in circular orbits with semi-amplitudes from 20 to 47 cm s^{-1}, thus corresponding to minimum masses in the range of 0.17 to 0.32 Earth masses..

The sub-Earth mass planet at 3.1533 days is in a close-to circular orbit with a semi-major axis of 0.0229 ± 0.0003 AU, thus located inwards from the habitable zone of Barnard's star, with an equilibrium temperature of 400 K.

Martins, R., et al (2024) **Primitive asteroids as a major source of terrestrial volatiles.** SCIEMCE ADVANCES 10:doi.org/10.1126/sciadv.ado4121 (available as a free pdf)

Authors' abstract: *The origins of Earth's volatiles are debated. Recent studies showed that meteorites display unique mass-independent isotopic signatures of the volatile element zinc, suggesting that Earth's Zn originated from materials derived from different regions of the Solar System.*

However, these studies largely omitted meteorites from the differentiated planetesimals thought to represent the Earth's building blocks, which underwent melting and substantial volatile loss.

Here, we characterize the mass-independent Zn isotope compositions of meteorites from such planetesimals. We incorporate these results in mixing models that aim to reproduce Earth's abundance and isotope compositions of Zn and other elements.

Our results suggest that, while differentiated planetesimals supplied ~70% of Earth's mass, they provided only ~10% of its Zn. The remaining Zn was supplied by primitive materials that did not experience melting and associated volatile loss.

Combined with other findings, our results imply that an unmelted primitive material is likely required to establish the volatile budgets of the terrestrial planets.

Space Travel.

Pilles, E., et al (2024) **How we can mine asteroids for space food.** INTERNATIONAL JOURNAL OF ASTROBIOLOGY 23:doi.org/10.1017/S1473550424000119 (available as a free pdf)

Authors' abstract: *To deeply explore the solar system, it will be necessary to become less reliant on the resupply tether to Earth. An approach explored in this study is to convert hydrocarbons in asteroids to human edible food.*

After comparing the experimental pyrolysis breakdown products, which were able to be converted to biomass using a consortia, it was hypothesized that equivalent chemicals found on asteroids could also be converted to biomass with the same nutritional content as the pyrolyzed products.

This study is a mathematical exercise that explores the potential food yield that could be produced from these methodologies. This study uses the abundance of aliphatic hydrocarbons in the Murchison meteorite (>35 ppm) as a baseline for the calculations, representing the minimum amount of organic matter that could theoretically be attributed to biomass production.

Calculations for the total carbon in solvent-insoluble organic matter (IOM) represent the maximum amount of organic matter that could theoretically be attributed to food production. These two values will provide a range of realistic yields to determine how much food could theoretically be extractable from an asteroid.

The results of this study found that if only the aliphatic hydrocarbons can be converted into biomass (minimum scenario) the resulting mass of edible biomass extractable from asteroid Bennu ranges from 5.070×10^7 grammes to 2.390×10^8 grammes.

If the biomass extraction process, however, is more efficient, and all IOM is converted into edible biomass (maximum scenario), then the mass of edible biomass extractable from asteroid Bennu ranges from 1.391×10^9 grammes to 6.556×10^9 grammes.

This would provide between 5.762×10^8 and 1.581×10^{10} calories that is enough to support between 600 and 17,000 astronaut life years.

The asteroid mass needed to support one astronaut for one year is between 160,000 metric tons and 5,000 metric tons. Based on these results, this approach of using carbon in asteroids to provide a distributed food source for humans appears promising, but there are substantial areas of future work.

George, S.P., et al (2024) **Space radiation measurements during the Artemis I lunar mission.** NATURE 634:doi.org/10.1038/s41586-024-07927-7 (available as a free pdf)

Authors' abstract: *Space radiation is a notable hazard for long-duration human spaceflight. Associated risks include cancer, cataracts, degenerative diseases and tissue reactions from large, acute exposures.*

Space radiation originates from diverse sources, including galactic cosmic rays, trapped-particle (Van Allen) belts and solar-particle events.

Previous radiation data are from the International Space Station and the Space Shuttle in low-Earth orbit protected by heavy shielding and Earth's magnetic field and lightly shielded interplanetary robotic probes such as Mars Science Laboratory and Lunar Reconnaissance Orbiter.

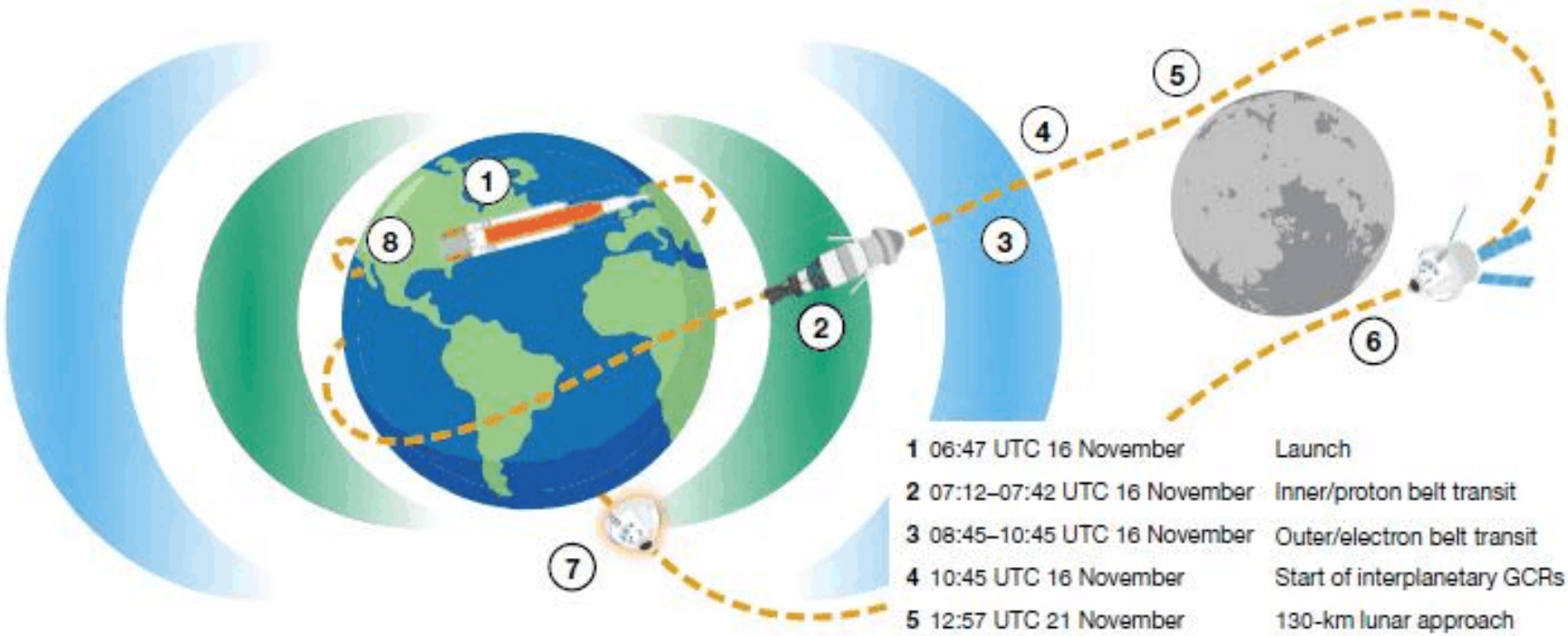
Limited data from the Apollo missions and ground measurements with substantial caveats are also available. Here we report radiation measurements from the heavily shielded Orion spacecraft on the uncrewed Artemis I lunar mission.

At differing shielding locations inside the vehicle, a fourfold difference in dose rates was observed during proton-belt passes that are similar to large, reference solar-particle events.

Interplanetary cosmic-ray dose equivalent rates in Orion were as much as 60% lower than previous observations. Furthermore, a change in orientation of the spacecraft during the proton-belt transit resulted in a reduction of radiation dose rates of around 50%.

These measurements validate the Orion for future crewed exploration and inform future human spaceflight mission design. Characterization of the space radiation environment in the crew cabin was a key objective of Artemis I.

[Images are from this paper.]



The Orion flight profile with respect to radiation for the NASA Artemis I

Geology.

Suzuki, Y., et al (2024) **Subsurface microbial colonization at mineral-filled veins in 2-billion-year-old mafic rock from the Bushveld Igneous Complex, South Africa.** MICROBIAL ECOLOGY 87:doi.org/10.1007/s00248-024-02434-8 (available as a free pdf)

Authors' abstract: *Recent advances in subsurface microbiology have demonstrated the habitability of multi-million-year-old igneous rocks, despite the scarce energy supply from rock-water interactions.*

Given the minimal evolution coupled with exceedingly slow metabolic rates in subsurface ecosystems, spatiotemporally stable igneous rocks can sustain microbes over geological time scales.

This study investigated a 2-billion-year-old mafic rock in the Bushveld Igneous Complex, South Africa, where ultradeep drilling is being executed by the International Continental Scientific Drilling Program (ICDP).

New procedures were successfully developed to simultaneously detect indigenous and contaminant microbial cells in a drill core sample.

Precision rock sectioning coupled with infrared, fluorescence, and electron microscopy imaging of the rock section with submicron resolution revealed microbial colonization in veins filled with clay minerals.

The entry and exit of microbial cells in the veins are severely limited by tight packing with clay minerals, the formation of which supplies energy sources for long-term habitability.

Further microbiological characterization of drilled rock cores from the Bushveld Igneous Complex will expand the understanding of microbial evolution in deep igneous rocks over 2 billion years.

The metabolic activities of subsurface microbiomes are exceedingly slow under survival mode, leading to an estimated turnover time ranging from several thousand to million years.

Voisey, C.R., et al (2024) **Gold nugget formation from earthquake-induced piezoelectricity in quartz.** NATURE GEOSCIENCE 17:doi.org/10.1038/s41561-024-01514-1 (available as a free pdf)

Authors' abstract: *Gold nuggets occur predominantly in quartz veins, and the current paradigm posits that gold precipitates from dilute (<1 mg kg^{-1} gold), hot, water ± carbon dioxide-rich fluids owing to changes in temperature, pressure and/or fluid chemistry.*

However, the widespread occurrence of large gold nuggets is at odds with the dilute nature of these fluids and the chemical inertness of quartz. Quartz is the only abundant piezoelectric mineral on Earth, and the cyclical nature of earthquake activity that drives orogenic gold deposit formation means that quartz crystals in veins will experience thousands of episodes of deviatoric stress.

Here we use quartz deformation experiments and piezoelectric modelling to investigate whether piezoelectric discharge from quartz can explain the ubiquitous gold-quartz association and the formation of gold nuggets.

We find that stress on quartz crystals can generate enough voltage to electrochemically deposit aqueous gold from solution as well as accumulate gold nanoparticles. Nucleation of gold via piezo-driven reactions is rate-limiting because quartz is an insulator.

However, since gold is a conductor, our results show that existing gold grains are the focus of ongoing growth. We suggest this mechanism can help explain the creation of large nuggets and the commonly observed highly interconnected gold networks within quartz vein fractures.

Ore deposits represent natural enrichments of elements compared with their normal distribution in Earth's crust. Gold deposits stand out by having the highest degree of enrichment, by factors of 10^3 to 10_4 required to make economic deposits (4 to 40 ppm gold), compared with base metals, such as copper, that require ~200× enrichment.

Gold nuggets represent the most extreme examples of this gold enrichment. Most nuggets originate from the quartz veins formed in orogenic gold systems found around the world.

These systems have had exceptional economic importance throughout human history, representing up to 75% of all gold ever mined.

In orogenic gold systems, gold-bearing hydrothermal fluids from the mid- to lower crust are transported along fracture networks by seismic ruptures associated with regional collisional tectonics. These systems are hosted in rocks of variable metamorphic grade involving mid- to upper-crustal conditions between 200˚C and 650˚C and 1 to 5 kbar.

The pervasive occurrence of crack-seal microstructures in quartz-carbonate veining found in these deposits indicates formation from hundreds to thousands of episodic fluid infiltration events, each associated with separate earthquakes.

The cyclic nature of these seismic events means that fractures are periodically opened and filled with fluids, resulting in spatially focused quartz-gold vein systems.

Han, X., et al (2024) **Recent uplift of Chomolungma enhanced by river drainage piracy.** NATURE GEOSCIENCE 17:doi.org/10.1038/s41561-Article 1-024-01535-w (available as a free pdf)

[When a river erodes back into another river and captures its water flow, erosion patterns are altered. Accelerated erosion results in less bedrock, which lifts the land, known as isostatic rebound.]

Authors' abstract: *The Himalayas, which host glaciers, modulate the Indian Monsoon, and create an arid Tibetan Plateau, play a vital role in distributing freshwater resources to the world's most populous regions. The Himalayas formed under prolonged crustal thickening and erosion by glaciers and rivers.*

Chomolungma (8,849 metres), also known as Mount Everest or Sagarmatha, is higher than surrounding peaks, and GPS measurements suggest a higher uplift rate in recent years than the long-term trend.

Here we analyse the potential contribution of a river capture event in the Kosi River drainage basin on the renewed surface uplift of Chomolungma. We numerically reconstruct the capture process using a simple stream power model combined with nonlinear inverse methods constrained by modern river profiles.

Our best-fit model suggests the capture event occurred approximately 89 thousand years ago and caused acceleration of downstream incision rates. Flexural models estimate this non-steady erosion triggers isostatic response and surface uplift over a broad geographical area.

We suggest that part of Chomolungma's anomalous elevation (~15 to 50 metres) can be explained as the isostatic response to capture-triggered river incision, highlighting the complex interplay between geological dynamics and the formation of topographic features.

Chomolungma, also known as Mount Everest or Sagarmatha, is the highest mountain on Earth, towering over other peaks in the Himalayas. At 8,849 metres above sea level, Chomolungma is ~250 metres higher than the other tallest peaks in the Himalaya.

This is surprising given the relative along-strike uniformity of tectonics in the Himalayas, which provides mountain peak buoyancy with local, small-scale variability, and relatively uniform climatic conditions and erosional processes. Despite this, Chomolungma deviates from the linear trend of the elevation of Himalayan peaks plotted against their elevation rank.

A simplistic analysis hints that this anomalous elevation (on the order of one to two hundred metres) could be the result of a scenario where peak elevations were relatively uniformly distributed, but an additional component of elevation has been added to only some of the peaks (including the highest peak).

Only the highest of these affected peaks would disrupt the linear trend, whereas lower peaks affected by the additional elevation simply move up the ranking.

Further evidence suggests a disconnect between the short-term rock uplift rate of Chomolungma measured from GPS data (~2 mm yr^{-1}) and its long-term rock uplift rate recorded by thermochronology (~1 mm yr^{-1}), which raises the question, is there an underlying mechanism raising Chomolungma's anomalous elevation ever higher?

One potential mechanism to explain Chomolungma's anomalous elevation and recent increased rock uplift rates becomes apparent when inspecting its surrounding rivers. T

he Arun River, a major tributary of the Kosi River, drains a large area to the north of Chomolungma before turning south, passing by the world's tallest peak and cutting a deep gorge through the core of the Himalayas.

If recent drainage piracy is responsible for the drainage pattern of the Kosi River and Arun River, an increase in river discharge due to capture would drive gorge incision.

This incision would trigger isostatic compensation, causing Earth's crust to rebound, resulting in surface uplift of the unincised parts of the surrounding area, including the mountain peaks.

The size of the surrounding area that rebounds due to incision is controlled by the strength of the lithosphere. Flexural isostatic rebound, and resulting surface uplift, in response to capture-driven incision of the Arun River could therefore explain part of the observed elevation anomaly of Chomolungma.

Origin Of Life.

Johansen, A., et al (2024) **Self-oxidation of the atmospheres of rocky planets with implications for the origin of life.** ASTROBIOLOGY 24:doi.org/10.1089/ast.2023.0104 (available as a free pdf)

Authors' abstract: *Rocky planets may acquire a primordial atmosphere by the outgassing of volatiles from their magma ocean. The distribution of O between H_2O, CO, and CO_2 in chemical equilibrium subsequently changes significantly with decreasing temperature.*

We consider here two chemical models: one where CH_4 and NH_3 are assumed to be irrevocably destroyed by photolysis and second where these molecules persist.

In the first case, we show that CO cannot coexist with H_2O, since CO oxidizes at low temperatures to form CO_2 and H_2. In both cases, H escapes from the thermosphere within a few 10 million years by absorption of stellar XUV radiation.

This escape drives an atmospheric self-oxidation process, whereby rocky planet atmospheres become dominated by CO_2 and H_2O regardless of their initial oxidation state at outgassing. HCN is considered a potential precursor of prebiotic compounds and RNA.

Oxidizing atmospheres are inefficient at producing HCN by lightning. Alternatively, we have demonstrated that lightning-produced NO, which dissolves as nitrate in oceans, and interplanetary dust particles may be the main sources of fixed nitrogen in emerging biospheres.

Our results highlight the need for origin-of-life scenarios where the first metabolism fixes its C from CO_2, rather than from HCN and CO.

Wogan, N.F., et al (2024) **Timing and likelihood of the origin of life derived from post-impact highly reducing atmospheres.** ASTROBIOLOGY 24:doi.org/10.1089/ast.2023.0128 (available as a free pdf)

Authors' abstract: *Big impacts on the early Earth would have created highly reducing atmospheres that generated molecules needed for the origin of life, such as nitriles.*

However, such impactors could have been followed by collisions that were sufficiently big to vaporize the ocean and destroy any pre-existing life. Thus, a post-impact-reducing atmosphere that gives rise to life needs to be followed by a lack of subsequent sterilizing impacts for life to persist.

*We assume that prebiotic chemistry required a post-impact-reducing atmosphere. Then, using statistics for the impact history on Earth and the minimum impact mass needed to generate post-impact highly reducing atmospheres, we show that the median timing of impact-driven biopoiesis is favored early in the Hadean, *4.35 gigayears ago.*

*However, uncertainties are large because impact bombardment is stochastic, and so biopoiesis could have occurred between 4.45 and 3.9 Ga within 95% uncertainty. In an optimistic scenario for biopoiesis from post-impact-reducing atmospheres, we find that the origin of life is favorable in *90% of stochastic impact realizations.*

*In our most pessimistic case, biopoiesis is still fairly likely (*20% chance). This potentially bodes well for life on rocky exoplanets that have experienced an early episode of impact bombardment given how planets form.*

Harding, M.A.R., et al (2024) **Amide groups in 3.7 billion years old liquid inclusions.** SCIENTIFIC REPORTS 14:doi.org/10.1038/s41598-024-74571-6 (available as a free pdf)

Authors' abstract: *Carbon with depleted $d^{13}C$ found in > 3.7 billion year old metamorphic sediments from the Isua Supracrustal Belt, Southwestern Greenland, has been proposed to represent the oldest remains of life on Earth.*

Graphitic inclusions within garnet porphyroblasts from this locality have been shown to associate with elements consistent with biogenic remains.

In this report, we focus on certain liquid inclusions found in the Isua garnets, characterizing their chemical composition using atomic force microscopy, AFM-based infrared spectroscopy, optical photothermal infrared spectroscopy, Raman spectroscopy, and time-of-flight secondary ion mass spectrometry.

Our results show that the liquid inclusions contain functional groups consisting of carbon, nitrogen, and oxygen in a configuration similar to amide functional groups.

We suspect that the amide groups formed from N, O and C-containing volatile components that were released from the original kerogenous material enclosed in the garnets, as this was graphitized during thermal maturation. This is consistent with the observed inclusion assemblage of solid graphitic and viscous fluid inclusions alike.

Our observations are compatible with the inclusions forming from biogenic precursor material, and when considered alongside previous reports on the carbonaceous material in the Isua metamorphic sediments, these and our study collectively indicate that the carbonaceous material in the Isua metasediments represents the oldest traces of life on Earth.

Paleobiology.

Schultz, T.R., et al (2024)) **The co-evolution of fungus-ant agriculture.** SCIENCE 386:doi.org/10.1126/science.adn7179

Authors' abstract: *Fungus-farming ants cultivate multiple lineages of fungi for food, but, because fungal cultivar relationships are largely unresolved, the history of fungus-ant coevolution remains poorly known. We designed probes targeting >2,000 gene regions to generate a dated evolutionary tree for 475 fungi and combined it with a similarly generated tree for 276 ants.*

We found that fungus-ant agriculture originated ~66 million years ago when the end-of-Cretaceous asteroid impact temporarily interrupted photosynthesis, causing global mass extinctions but favoring the proliferation of fungi.

Subsequently, ~27 million years ago, one ancestral fungal cultivar population became domesticated, i.e., obligately mutualistic, when seasonally dry habitats expanded in South America, likely isolating the cultivar population from its free-living, wet forest-dwelling conspecifics.

By revealing these and other major transitions in fungus-ant coevolution, our results clarify the historical processes that shaped a model system for nonhuman agriculture.

Zoology.

Levin, I., et al (2024) **Asymmetric fluid flow in helical pipes inspired by shark intestines.** PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES USA 121:doi.org/10.1073/pnas.2406481121

Authors' abstract: *Unlike human intestines, which are long, hollow tubes, the intestines of sharks and rays contain interior helical structures surrounding a cylindrical hole. One function of these structures may be to create asymmetric flow, favoring passage of fluid down the digestive tract, from anterior to posterior.*

Here, we design and 3D print biomimetic models of shark intestines, in both rigid and deformable materials. We use the rigid models to test which physical parameters of the interior helices (the pitch, the hole radius, the tilt angle, and the number of turns) yield the largest flow asymmetries.

These asymmetries exceed those of traditional Tesla valves, structures specifically designed to create flow asymmetry without any moving parts. When we print the biomimetic models in elastomeric materials so that flow can couple to the structure's shape, flow asymmetry is significantly amplified; it is sevenfold larger in deformable structures than in rigid structures.

Last, we 3D-print deformable versions of the intestine of a dogfish shark, based on a tomogram of a biological sample. This biomimic produces flow asymmetry comparable to traditional Tesla valves.

The ability to influence the direction of a flow through a structure has applications in biological tissues and artificial devices across many scales, from large industrial pipelines to small microfluidic devices.

Botany.

Sallon, S., et al (2024) **Characterization and analysis of a *Commiphora* species germinated from an ancient seed suggests a possible connection to a species mentioned in the Bible.** COMMUNICATIONS BIOLOGY 7:doi.org/10.1038/s42003-024-06721-5 (available as a free pdf)

[Is there no balm in Gilead?]

Authors' abstract: *A seed recovered during archaeological excavations of a cave in the Judean desert was germinated, with radiocarbon analysis indicating an age of 993 CE to 1202 calCE.*

DNA sequencing and phylogenetic analysis identified the seedling as belonging to the angiosperm genus Commiphora Jacq., sister to three Southern African Commiphora species, but unique from all other species sampled to date.

The germinated seedling was not closely related to Commiphora species commonly harvested for their fragrant oleoresins including Commiphora gileadensis (L.) C.Chr., candidate for the locally extinct "Judean Balsam" or "Balm of Gilead" of antiquity.

GC-MS analysis revealed minimal fragrant compounds but abundance of those associated with multi-target bioactivity and a previously undescribed glycolipid compound series.

Several hypotheses are offered to explain the origins, implications and ethnobotanical significance of this unknown Commiphora sp., to the best of our knowledge the first identified from an archaeological site in this region, including identification with a resin producing tree mentioned in Biblical sources and possible agricultural relationship with the historic Judean Balsam.

The germination of ancient seeds derived from archaeological sites, permafrost, and historical and botanical collections with verifiable provenance and properly dated radiocarbon analysis include;
~30,000 year-old Silene sp. from Siberian permafrost;
2,000 year-old date seeds,
live callus from 1,600 year-old Anagyris foetida seeds,
1,300 year-old lotus seeds,
680 year-old peatland Sphagnum spores, and
151 year-old acacia seeds.

Reviving historic seeds has generated considerable interest because of its potential applications to many fields as a way to bring back lost taxa and identify earlier and extinct phenotypes; contribute to a better understanding of crop domestication, evolution and improvement of current crops;

circumvent sequencing errors arising from degraded ancient DNA through the emerging field of "resurrection genomics";
reinforce populations of rare species and revive species extinct in the wild;
provide valuable information on seed longevity, resilience and stress tolerance with implications for agriculture, biodiversity conservation and seed banking technology;
discovery of compounds of potential pharmaceutical interest;
enable a better understanding of ancient societies through insights into past environments, ethnobotany, economies, society and material culture.

In the current study, we report on the germination and growth of an ancient seed identified as belonging to the Commiphora genus recovered during archaeological excavations of a natural cave in the northern Judean desert.

The Commiphora genus (Gr: "kommi" gum bearing), a species-rich member of the Frankincense and Myrrh family (Burseraceae) predominantly distributed in Africa, Madagascar and the Arabian Peninsula, has been valued throughout history for its economic and ethnobotanical uses because of the aromatic gum resins or oleoresins produced by members of this family.

Since the 18th century, Commiphora gileadensis, an extant, highly aromatic species native to the Arabian Peninsula and northeast tropical Africa, and one of at least 25 Commiphora species whose oleoresins are used ethnomedicinally, has been considered a candidate for the historic "Judean Balsam" or "Balm of Judea", cultivated in this region for at least 1,000 years exclusively at oasis

sites around the Dead Sea basin. The most valuable export of ancient Judea (modern day Israel and Palestine) and described extensively by writers in antiquity, Judean Balsam, was highly prized for its fragrant aromatic resin "opobalsamum" (Gk: "sap of balsamon") and its many economic uses.

Judean Balsam, however, disappeared from the region by the 9th century CE, leading to an extended, unresolved debate in published literature regarding its scientific identity and if it had survived elsewhere.

Nevertheless, identification of Judean Balsam with Commiphora gileadensis is contestable due to morphological differences between the two, lack of verified archaeobotanical remains of any Commiphora species in the Southern Levant (modern day Israel, Palestine and Jordan) and the absence of a native, extant Commiphora species in the region today.

[Images are from this paper.]

Fig. 1 | Morphological features of "Sheba" at different ages. **(a)** ancient seed prior to planting **(b)** developing seed at 5 weeks showing epicotyl and developing cotyledons covered by seed coat **(c)** seedling (6 months) **(d)** peeling bark (12 years) **(e)** leaves showing fine hairs (12 years) **(f)** mature tree (12 years). Permission for the use of pictures shown in Fig. 1 **(a)** and **(c-f)** was provided by Mr Guy Eisner and for Fig. 1 **(b)** by Dr Elaine Solowey.

Environmental Science.

Marisaldi, M., et al (2024) **Highly dynamic gamma-ray emissions are common in tropical thunderclouds.** NATURE 634:doi.org/10.1038/s41586-024-07936-6 (available as a free pdf)

Authors' abstract: *Thunderstorms emit fluxes of gamma rays known as gamma-ray glows, sporadically observed by aircraft, balloons, and from the ground.*

Observations report increased gamma-ray emissions by tens of percent up to two orders of magnitude above the background, sometimes abruptly terminated by lightning discharges.

Glows are produced by the acceleration of energetic electrons in high-electric-field regions within thunderclouds and contribute to charge dissipation. Glows had been considered as quasi-stationary phenomena with durations up to a few tens of seconds and spatial scales up to 10 to 20 km.

However, no measurements of the full extension in space and time of a gamma-ray-glow region and their occurring frequency have been reported so far.

Here we show that tropical thunderclouds over ocean and coastal regions commonly emit gamma rays for hours over areas up to a few thousand square kilometres.

Emission is associated with deep convective cores; it is not uniform and continuous but shows characteristic timescales of 1 to 10 seconds and even subsecond for individual glows.

The dynamics of gamma-glowing thunderclouds strongly contradicts the quasi-stationary picture of glows and instead resembles that of a huge gamma-glowing 'boiling pot' in both pattern and behaviour.

During the Airborne Lightning Observatory for FEGS and TGFs (ALOFT) aircraft campaign over the Caribbean and Central America in the summer of 2023, the simplistic picture of localized and uniformly gamma-ray-glowing thunderclouds was overridden.

Owing to a new mission concept, in which 1-second-resolution data were downlinked during flight, gamma-ray-glowing clouds could be identified in real time and the pilot was instructed to return to the same location until the thundercloud stopped glowing.

ALOFT detected more than 500 1 to 10-seconds-long individual gamma-ray glows during nine of the ten flights, all over ocean or coastal regions, showing that thunderclouds can emit gamma rays for hours and over huge regions.

Human Prehistory.

Zeller, E., and A. Timmermann (2024) **The evolving three-dimensional landscape of human adaptation.** SCIENCE ADVANCES 10:doi.org/10.1126/sciadv.adq3613 (available as a free pdf)

Authors' abstract: *Over the past 3 million years, humans have expanded their ecological niche and adapted to more diverse environments. The temporal evolution and underlying drivers behind this niche expansion remain largely unknown.*

By combining archeological findings with landscape topographic data and model simulations of the climate and biomes, we show that human sites clustered in areas with increased terrain roughness, corresponding to higher levels of biodiversity.

We find a gradual increase in human habitat preferences toward rough terrains until about 1.1 million years ago (Ma), followed by a 300 thousand-year-long contraction of the ecological niche.

This period coincided with the Mid-Pleistocene Transition and previously hypothesized ancestral population bottlenecks.

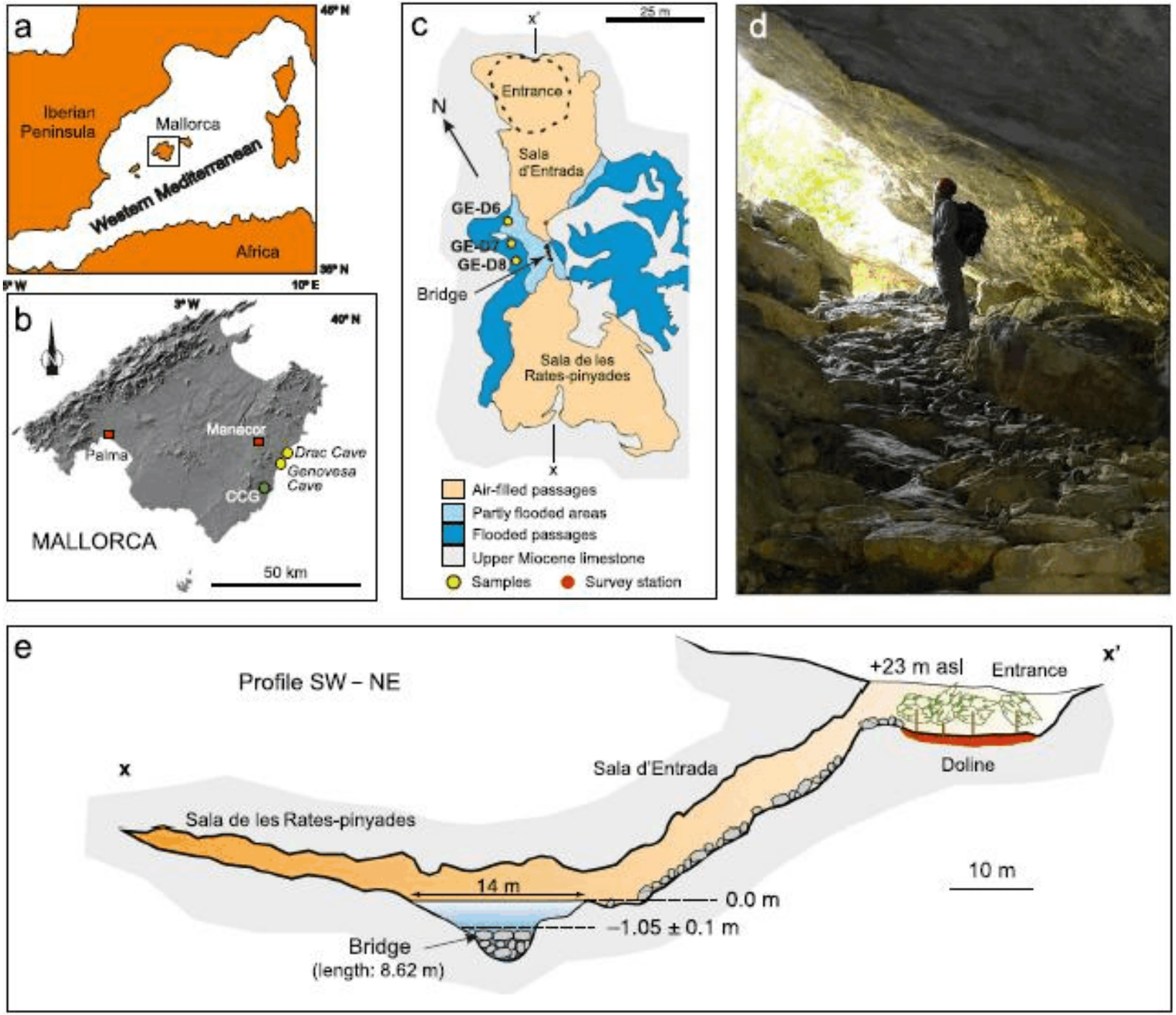
Our statistical analysis further reveals that from 0.8 Ma onward, the human niche expanded again, with human species (e.g., H. heidelbergensis, H. neanderthalensis, and H. sapiens) adapting to rougher terrain, colder and drier conditions, and toward regions of higher ecological diversity.

Onac, B.P, et al (2024) **Submerged bridge constructed at least 5,600 years ago indicates early human arrival in Mallorca, Spain.** COMMUNICATIONS EARTH AND ENVIRONMENT 5:doi.org/10.1038/s43247-024-01584-4 (available as a free pdf)

Authors' abstract: *Reconstructing early human colonization of the Balearic Islands in the western Mediterranean is challenging due to limited archaeological evidence. Current understanding places human arrival ~4,400 years ago. Here, U-series data from phreatic overgrowth on speleothems are combined with the discovery of a submerged bridge in Genovesa Cave that exhibits a distinctive coloration band near its top.*

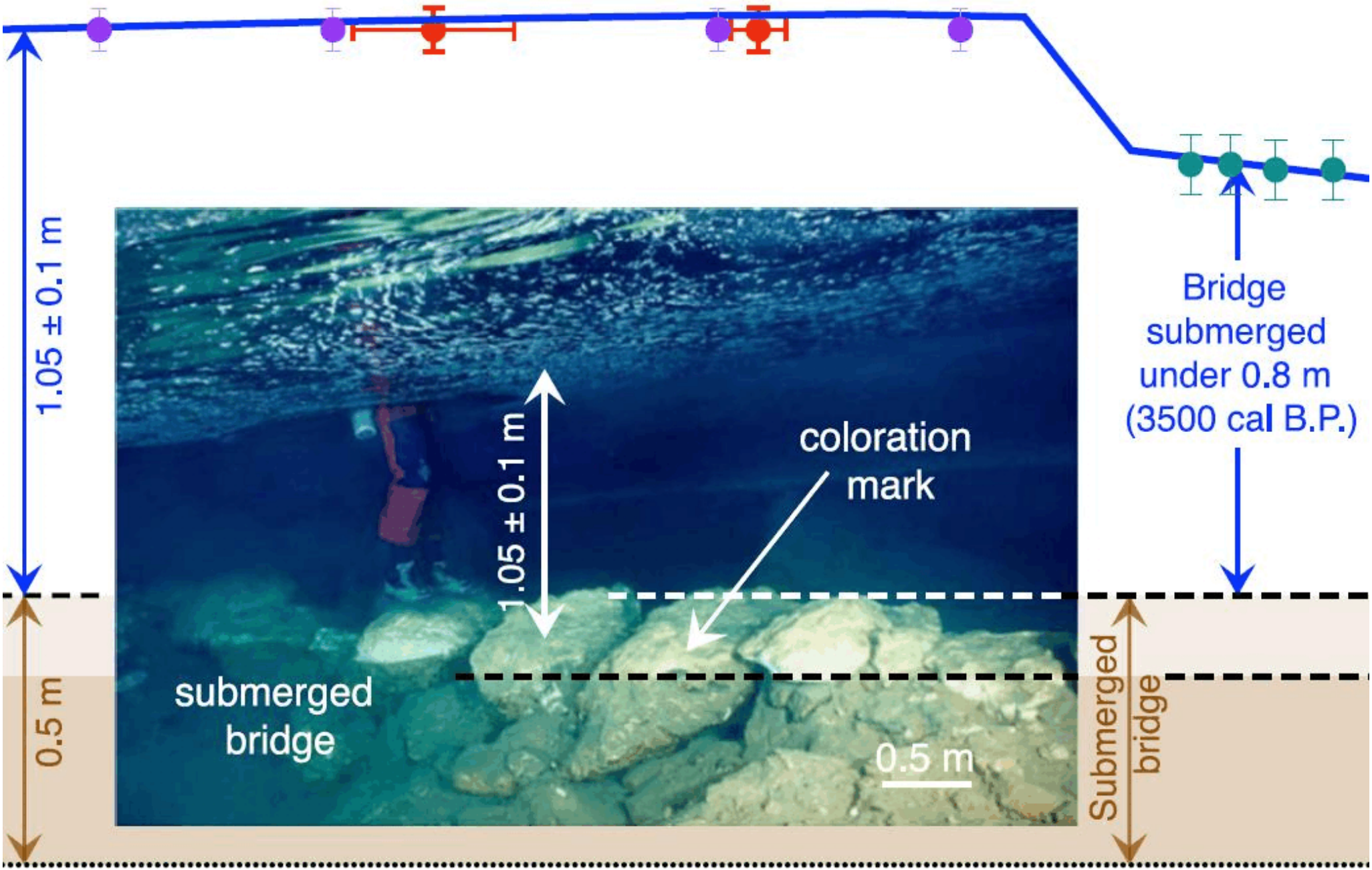
The band is at the same depth as the phreatic overgrowth on speleothems (-1.1 meters), both of which indicate a sea-level stillstand between ~6000 and ~5400 years ago.

Integrating the bridge depth with a high-resolution Holocene sea-level curve forMallorca and the dated phreatic overgrowth on speleothems level constrains the construction of the bridge between ~6,000 and ~5,600 years ago.



Subsequent sea-level rise flooded the archeological structure, ruling out later construction dates. This provides evidence for early human presence on the island dating at least 5,600 and possibly beyond ~6,000 years ago.

[Images are from this paper.]



Sakaia, M., et al (2024) **AI-accelerated Nazca survey nearly doubles the number of known figurative geoglyphs and sheds light on their purpose.** 121:doi.org/10.1073/pnas.2407652121 (available as a free pdf)

Authors' abstract: *It took nearly a century to discover a total of 430 figurative Nazca geoglyphs, which offer significant insights into the ancient cultures at the Nazca Pampa.*

Here, we report the deployment of an AI system to the entire Nazca region, a UNESCO World Heritage site, leading to the discovery of 303 new figurative geoglyphs within only 6 months of field survey, nearly doubling the number of known figurative geoglyphs.

Even with limited training examples, the developed AI approach is demonstrated to be effective in detecting the smaller relief-type geoglyphs, which unlike the giant line-type geoglyphs are very difficult to discern.

The improved account of figurative geoglyphs enables us to analyze their motifs and distribution across the Nazca Pampa. We find that relief-type geoglyphs depict mainly human motifs or motifs of things modified by humans, such as domesticated animals and decapitated heads (81.6%).

T hey are typically located within viewing distance (on average 43 metres) of ancient trails that crisscross the Nazca Pampa and were most likely built and viewed at the individual or small-group level.

On the other hand, the giant line-type figurative geoglyphs mainly depict wild animals (64%). They are found an average of 34 metres from the elaborate linear/trapezoidal network of geoglyphs, which suggests that they were probably built and used on a community level for ritual activities.

Fig. 2. Fifteen of a total of 303 newly discovered relief-type figurative geoglyphs from the AI-assisted survey. Drone images taken during the field survey that confirmed the geoglyphs as authentic. The scale bars are 5 m. Outlines have been added as a guide to the eye.

Geoglyphs are motifs created on the ground by manipulating surface stones or gravel and are found throughout the Nazca Pampa. They provide archaeologists with a unique window into the cultures and beliefs of the ancient people who started to use them at least 2,000 years ago.

Located 50 km inland from the south coast of Peru, on a desert tableland about 500 metres above sea level, these geoglyphs have persisted for millennia because they were constructed in an area not easily affected by flooding and not suitable for agriculture. They were rediscovered in the early 20th century.

Geoglyphs are divided into geometric and figurative. Each of these types can be further divided into stylistic subtypes. For example, the several-kilometer-long Nazca lines are part of the linear style of geometric geoglyphs, whereas the giant trapezoids are part of the areal style of geometric geoglyphs.

Known figurative geoglyphs depict humanoids, animals (bird, monkey, fox, spider, lizard, killer whale, whale, fish, feline, and camelid), plants (flower, seaweed, rhizome, and tree), and tools (needle, loom, pin, fan, and musical instrument).

Figurative geoglyphs were also built in two distinct styles, the line-type and the relief-type style. Line-type figurative geoglyphs are large, with an average length of 90 metres.

Our field survey, in which we have walked near the geoglyphs for ground truthing, has revealed that there are 50 examples of this type of geoglyphs, of which 64% depict wild animals.

On the other hand, 380 relief-type figurative geoglyphs are known to exist on the Nazca Pampa and surrounding areas. Relief-type geoglyphs are on average only 9 metres in size, and they often depict humanoids and domesticated animals, more specifically llamas. However, since a comprehensive survey of them is lacking, it is uncertain whether this trend can be confirmed.

[Images are from this paper.]

Modern Humans.

Kuhla, K., et al (2024) **International cooperation was key to stabilize wheat prices after the Russian invasion of Ukraine.** COMMUNICATIONS EARTH AND ENVIRONMENT 5:doi.org/10.1038/s43247-024-01638-7 (available as a free pdf)

Authors' abstract: *The Russian invasion of Ukraine in 2022 triggered a global wheat price spike and food insecurities in import-dependent countries.*

We combine an analysis of the global wheat supply network with an agricultural commodity price model to investigate national impaired supplies and the global annual wheat price hike, respectively, for the trade year 2022.

Using a scenario analysis, we show that international cooperation manifested in the Black Sea Grain and Solidarity Lanes initiatives and the removal of export restrictions may have mitigated the 2022 price hike by 13 percentage points.

In a worst case scenario, characterized by multi-breadbasket harvest failures, escalating export restrictions, and blocked Ukrainian exports, wheat price increases by 90% compared to the 2000 to 2020 average.

Coping strategies, such as food-secure countries dispersing stocks, reducing wheat as feed, or boosting wheat production, are effective at mitigating the price spike in simplified scenarios. Our findings underscore the imperative of coordinated policy responses to avoid global food supply disruptions.

The concentration of production in a few main breadbasket regions and resulting import dependencies of many developing countries renders the global trade network for main food crops like wheat susceptible to system shocks disrupting global supply chains.

Within the last 20 years, two major world food price crises in 2007/08 and 2010/11 put tens of millions of additional people at risk of food insecurity triggering civil unrest around the globe.

Both crises were preceded by simultaneous harvest failures in several main breadbasket regions and aggravated by unilateral export restrictions by many countries, causing disproportionate spikes in food prices.

A decade later, the COVID-19 pandemic posed a serious threat to regiona and global food security. In doing so, it disproportionately impacted low- and middle-income populations and societies already grappling with environmental fragility and economic insecurity, such as those in the Sahel region.

Further, regional food security was jeopardized in recent years by pests and plagues, including the locust infestation in the Horn of Africa in 2019 and 202011, and extreme weather events like the devastating floods and droughts experienced in Nigeria.

Compounding extreme weather events in different main production regions can lead to multi-breadbasket failures and thus jeopardize food security also at the global level.

In the past many countries have responded to global supply failures by unilateral, uncoordinated policy interventions: exporters raised export restrictions and importers winded down restrictions. These interventions and the resulting market uncertainties further amplified agricultural price spikes.

The intensification of extreme weather events under global warming may exacerbate the risk of multi-breadbasket failures, in the absence of adequate adaptation measures. Studies have highlighted that disrupted supply chains, financial crisis, and changes in population and land use can put food security at risk in crisis situations.

In early 2022 food price levels were already high due to high fertilizer prices and pandemic-induced supply chain disturbances. The market uncertainties triggered by the Russian invasion of Ukraine then caused monthly prices for agricultural commodities, which Ukraine exports globally such as wheat, corn and sunflower oil, to exceed the peak levels of the two preceding crises.

For global food security, the impact on international wheat markets was arguably more critical than other food commodities, because Ukraine and Russia contribute about one-third of the world's wheat exports.

Many developing countries, especially in the Middle East, North and Sub-SaharanAfrica, and Southeast Asia, heavily rely on wheat imports from either Ukraine or Russia. Moreover, prior to the war, the World Food Program sourced nearly half of its global wheat supplies from Ukraine to support its food assistance.

Human Health.

De Koninck, J., et al (2024) **The practice of Daylight Saving Time in Canada: Its suitability with respect to sleep and circadian rhythms.** CANADIAN JOURNAL OF PUBLIC HEALTH 115:doi.org/10.17269/s41997-024-00870-0 (available as a free pdf)

Authors' abstract: *Daylight Saving Time (DST) is the practice of setting the clocks one hour forward from Standard Time (ST) in the spring and back again to ST in the fall.*

This commentary discusses the impact of bi-annual time changes on sleep and circadian rhythms and suggests avenues to minimize negative outcomes on the well-being of Canadian citizens.

Ideally, ST should be close to solar time, meaning that daylight is equally distributed before and after noon time, i.e., when the sun is at its highest point in the sky. In Canada, some provinces are proposing to opt out of DST to either return to constant ST throughout the year or to implement permanent DST.

National and international associations of clinicians and researchers on sleep and biological rhythms and in health sciences have positioned themselves in favour of permanent ST. In Canada, the Canadian Sleep Society and the Canadian Society for Chronobiology have also issued such a position.

Daylight Saving Time (DST) is the practice of setting the clocks one hour forward from Standard Time (ST) in the spring and back again to ST in the fall. ST is normally close to solar time, meaning that daylight is equally distributed before and after noon time, i.e., when the sun is at its highest point in the sky.

DST was widely introduced in Canada in 1914 mainly to save energy. In recent years, many countries have questioned the practice and, in several cases, have contemplated or implemented its abolishment and/or replacement with other time practices.

In Canada, some provinces are proposing to opt out of DST to either return to constant ST throughout the year or to implement permanent DST.

The reviews mentioned above confirm that even if the biannual time changes are only of one hour, both induce complaints in the population and psycho-

physiological disruptions because of sudden misalignments of light exposure and sleep/wake habits governed by the circadian clocks.

The March switch to DST is the one that induces the most disruptions since it forces a misalignment of the photoperiod that will continue through the next 8 months.

Moreover, the potential one hour loss of sleep can contribute to the immediate negative impact of DST on daytime functioning, physical and mental health issues, as well as reduced overall performances.

DST takes place during the night from Saturday to Sunday, giving only one night to adjust sleep schedules before the return to Monday's school and work activities. It still needs to be documented as to whether implementing DST on Friday night would reduce its immediate impact.

As for the misalignment with the biological clock, it enforces later darkness during the summer, favouring delayed bedtime, social jetlag (tendency to move social activities later in the evening), and potentially more sleep loss.

This effect is usually reversed with the return to ST in the fall. In the long term, if permanent DST were implemented, it would continue to affect sleep duration because of the permanent misalignment of the biological clock with light exposure.

Liu, H., et al (2024) **Arm position and blood pressure readings: The ARMS crossover randomized clinical trial.** JAMA INTERNAL MEDICINE 184:doi.org/10.1001/jamainternmed.2024.5213 (available as a free pdf)

Authors' abstract: *Guidelines for blood pressure (BP) measurement recommend arm support on a desk with the midcuff positioned at heart level. Still, nonstandard positions are used in clinical practice (eg, with arm resting on the lap or unsupported on the side).*

Participants were randomly assigned to sets of triplicate BP measurements with the arm positioned in 3 ways:
(1) supported on a desk (desk 1; reference),
(2) hand supported on lap (lap), and
(3) arm unsupported at the side (side).

To account for intrinsic BP variability, all participants underwent a fourth set of BP measurements with the arm supported on a desk (desk 2).

The trial enrolled 133 participants (53% female). 48 participants (36%) had SBP of 130 mm Hg or higher, and 55 participants (41%) had a body mass index (calculated as weight in kilograms divided by height in meters squared) of 30 or higher. Lap and side positions resulted in statistically significant higher BP readings than desk positions.

This crossover randomized clinical trial showed that commonly used arm positions (lap or side) resulted in substantial overestimation of BP readings and may lead to misdiagnosis and overestimation of hypertension.

Olshansky, S.J., et al (2024) **Implausibility of radical life extension in humans in the twenty-first century.** NATURE AGING 4:doi.org/10.1038/s43587-024-00702-3 (available as a free pdf)

Authors' abstract: *Over the course of the twentieth century, human life expectancy at birth rose in high-income nations by approximately 30 years, largely driven by advances in public health and medicine.*

Mortality reduction was observed initially at an early age and continued into middle and older ages. However, it was unclear whether this phenomenon and the resulting accelerated rise in life expectancy would continue into the twenty-first century.

Here using demographic survivorship metrics from national vital statistics in the eight countries with the longest-lived populations (Australia, France, Italy, Japan, South Korea, Spain, Sweden and Switzerland) and in Hong Kong and the United States from 1990 to 2019, we explored recent trends in death rates and life expectancy.

We found that, since 1990, improvements overall in life expectancy have decelerated. Our analysis also revealed that resistance to improvements in life expectancy increased while lifespan inequality declined and mortality compression occurred.

Our analysis suggests that survival to age 100 years is unlikely to exceed 15% for females and 5% for males, altogether suggesting that, unless the processes

of biological aging can be markedly slowed, radical human life extension is implausible in this century.

Before the middle of the nineteenth century, life expectancy at birth for humans languished at low levels by today's standards, between 20 years and 50 years. Improvements in survival were slow, punctuated often by episodic pandemics, plagues and contagions.

Advances in public health and medicine in the early twentieth century spawned a longevity revolution characterized initially by large and rapid increases in life expectancy at birth (e(0)).

e(0) increased at an accelerated rate, from an average of 1 year every one or two centuries for the previous 2,000 years to 3 years of life added per decade during the twentieth century (referred to a 'radical life extension').

The variable pace of improvement in e(0) was influenced by geographic location, economic development and temporal factors. This historic event began with reductions in early age mortality and continued later in the twentieth century with mortality improvements at middle and older ages.

Huttelmaier, S., et al (2024) **Phage communities in household-related biofilms correlate with bacterial hosts.** FRONTIERS IN MICROBIOMES 3:doi.org/10.3389/frmbi.2024.1396560 (available as a free pdf)

[Bacteriophages are viruses that attack only bacteria and are harmless to humans.]

Authors' abstract: *Here, we focus on the presence of viruses in household biofilms, specifically in showerheads and on toothbrushes. Bacteriophage, viruses that infect bacteria with high host specificity, have been shown to drive microbial community structure and function through host infection and horizontal gene transfer in environmental systems.*

Due to the dynamic environment, with extreme temperature changes, periods of wetting/drying and exposure to hygiene/cleaning products, in addition to low biomass and transient nature of indoor microbiomes, we hypothesize that phage host infection in these unique built environments are different from environmental biofilm interactions.

We approach the hypothesis using metagenomics, querying 34 toothbrush and 92 showerhead metagenomes. Representative of biofilms in the built environment, these interfaces demonstrate distinct levels of occupant interaction.

We identified 22 complete, 232 high quality, and 362 medium quality viral operational taxonomic units (OTUs). Viral community richness correlated with bacterial richness but not Shannon or Simpson indices.

Of quality viral OTUs with sufficient coverage (614), 532 were connected with 32 bacterial families, of which only Sphingomonadaceae, Burkholderiaceae, and Caulobacteraceae are found in both toothbrushes and showerheads.

Low average nucleotide identity to reference sequences and a high proportion of open reading frames annotated as hypothetical or unknown indicate that these environments harbor many novel and uncharacterized phages.

The results of this study reveal the paucity of information available on bacteriophage in indoor environments and indicate a need for more virus focused methods for DNA extraction and specific sequencing aimed at understanding viral impact on the microbiome in the built environment.

Human Behaviour.

Gehlbach, H., et al (2024) **The illusion of information adequacy.** PLOS ONE 19:doi.org/10.1371/journal.pone.0310216 (available as a free pdf)

Authors' abstract: *How individuals navigate perspectives and attitudes that diverge from their own affects an array of interpersonal outcomes from the health of marriages to the unfolding of international conflicts.*

The finesse with which people negotiate these differing perceptions depends critically upon their tacit assumptions, e.g., in the bias of naïve realism people assume that their subjective construal of a situation represents objective truth.

The present study adds an important assumption to this list of biases: the illusion of information adequacy. Specifically, because individuals rarely pause to consider what information they may be missing, they assume that the cross-section of relevant information to which they are privy is sufficient to

adequately understand the situation. Participants in our preregistered study (N = 1261) responded to a hypothetical scenario in which control participants received full information and treatment participants received approximately half of that same information.

We found that treatment participants assumed that they possessed comparably adequate information and presumed that they were just as competent to make thoughtful decisions based on that information.

Participants' decisions were heavily influenced by which cross-section of information they received. Finally, participants believed that most other people would make a similar decision to the one they made.

Arceneaux, K., et al (2024) **Facebook increases political knowledge, reduces well-being, and informational treatments do little to help.** ROYAL SOCIETY OPEN SCIENCE 11:doi.org/10.1098/rsos.240280 (available as a free pdf)

Authors' abstract: *Nearly three billion people actively use Facebook, making it the largest social media platform in the world. Previous research shows that the social media platform reduces users' happiness, while increasing political knowledge. It also may increase partisan polarization.*

Working to build a scientific consensus, we test whether the potential negative effects of Facebook use can be overcome with the help of minimalist informational interventions that a parallel line of research has shown to be effective at inducing people to be more accurate and civil.

We conducted a pre-registered well-powered Facebook deactivation experiment during the 2022 French presidential election. In line with previous research, we find that deactivating Facebook increases subjective well-being and reduces political knowledge.

However, deactivating Facebook had no overall effect on the level of political or social polarization during the election. Moreover, we find little evidence that minimalist informational interventions in a field setting helped individuals who deactivated Facebook to become better informed.

Luo, Y., et al (2024) **The expectations humans have of a pleasurable sensation asymmetrically shape neuronal responses and subjective experiences to hot sauce**. PLOS BIOLOGY 22:doi.org/10.1371/journal.pbio.3002818 (available as a free pdf)

Authors' abstract: *Expectations shape our perception, profoundly influencing how we interpret the world. Positive expectations about sensory stimuli can alleviate distress and reduce pain (e.g., placebo effect), while negative expectations may heighten anxiety and exacerbate pain (e.g., nocebo effect).*

To investigate the impact of the (an)hedonic aspect of expectations on subjective experiences, we measured neurobehavioral responses to the taste of hot sauce among participants with heterogeneous taste preferences. By identifying participants who "liked" versus those who strongly "disliked" spicy flavors and by providing contextual cues about the spiciness of the sauce to be tasted, we dissociated the effects of positive and negative expectations from sensory stimuli (i.e., visual and gustatory stimuli), which were the same across all participants.

Our results indicate that positive expectations lead to modulations in the intensity of subjective experience. These modulations were accompanied by increased activity in brain regions previously linked to information integration and the placebo effect, including the anterior insula, dorsolateral prefrontal cortex, and dorsal anterior cingulate cortex, as well as a predefined "pleasure signature."

In contrast, negative expectations decreased hedonic experience and increased neural activity in the previously validated "Neurological Pain Signature" network. These findings demonstrate that hedonic aspects of one's expectations asymmetrically shape how the brain processes sensory input and associated behavioral reports of one's subjective experiences of intensity, pleasure, and pain.

Our results suggest a dissociable impact of hedonic information: positive expectations facilitate higher-level information integration and reward processing, while negative expectations prime lower-level nociceptive and affective processes. This study demonstrates the powerful role of hedonic expectations in shaping subjective reality and suggests potential avenues for consumer and therapeutic interventions targeting expectation-driven neural processes.