OPUNTIA 417

Canada Day 2018

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.

About The Cover: I've seen many coyotes but never any that were leaping over spruce trees. This mural was painted on a pillar supporting the 4th Avenue flyover across the Bow River. Taken from Riverfront Avenue, which passes underneath it.

LIFE IN COWTOWN

photos by Dale Speirs

The last week of June was hectic for me. I edit the CALGARY PHILATELIST, published by the Calgary Philatelic Society. I picked up the July issue from the printer on Tuesday morning, June 26, stuffed 190 envelopes, and took them to the post office by noon. Stamp collectors also collect postmarks, therefore each issue is canceled at a different postal outlet.

Calgary has about 80 post offices, so anyone who stays a member long enough will eventually get a complete set of postmarks. Occasionally in the summer I take the envelopes to a nearby rural or mountain post office, but I was pressed for time today.

As that was happening, carpenters arrived to replace the rotten back steps of my house with a ramp. I specified a ramp because my house is a 1956 bungalow, and about every third year the basement sewer drain has to be augered out because of tree roots. If you haven't experienced the joys of home ownership, the auger is a very heavy piece of equipment that takes a strong man to wheel it down and back out of the basement. Fortunately the roots are on the City side of the boulevard so the Sewers crew does it for free.

Since the house is a teardown, the City won't spend the money replacing the line. I used to joke that I would have the last bungalow in my neighbourhood but it isn't such a joke anymore. Whoever buys my house from my heirs will rip it out and put in infills or row houses. It's on a double corner lot, so it is prime real estate. I won't move until paramedics carry me out feet first or I have to go into a nursing home, may God forbid. The neighbourhood is a quiet suburb, yet handy to buses and freeways. I couldn't find any place better to live if I sold out now and moved elsewhere.

Before and after.

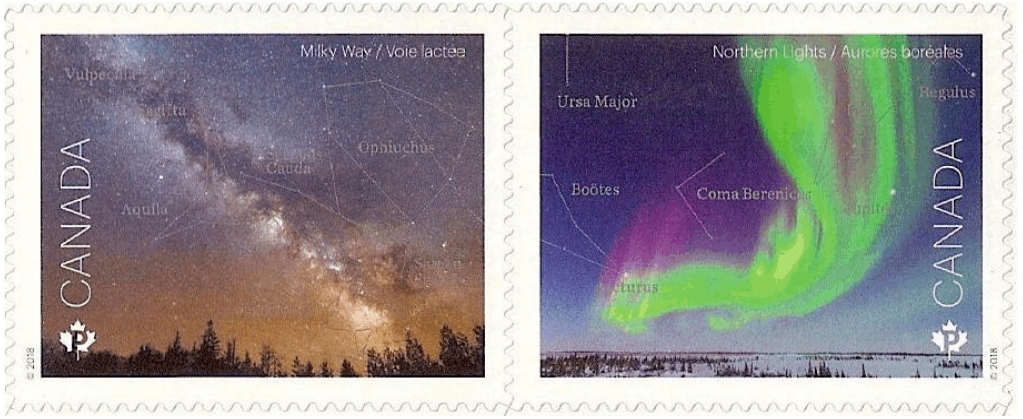
Thursday evening, June 28, was a special meeting of the CPS, to hear a presentation by Canada Post officials on forthcoming stamp issues for the next year or two. It takes 18 to 24 months to produce a stamp, from the time a topic is chosen, through the design stages, and then printing and distribution.

As to the meaning of the slide shown below, later this summer Canada Post will issue a set of stamps showing sharks of Canadian waters.

Friday evening was another Canada Post event, a first day of issue ceremony for the Astronomy stamps released that day, June 29. It was held at the University of Calgary campus at the annual convention of the Royal Astronomical Society of Canada. The stamps were issued on the occasion of the RASC's 150th anniversary this year.

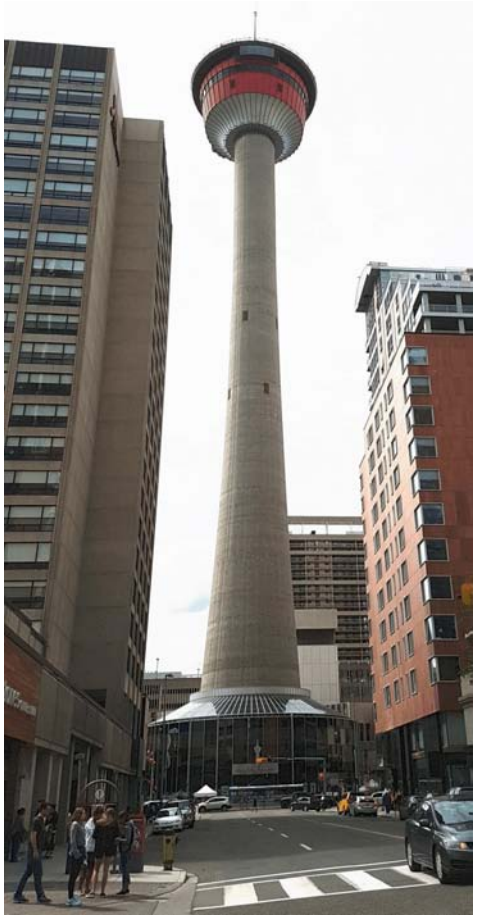
I got there too early and sat through a lecture on super-radiance, which is one of those things quantum physicists keep coming up with. Basically it has to do with certain circumstances under which stars in gassy areas of the galaxy with lots of methanol and water molecules floating in space can turn into masers (microwave lasers). They flash beams of pure coherent microwaves.

The Astronomy stamps were officially unveiled by RASC astronomers who had supplied photographs or design advice for the stamps.



Meanwhile, in my front yard, I had a good crop of flowers.
Below: *Yucca glauca* is native to the southeastern Albertan desert.

Above: *Gaillardia aristata* is found throughout the southern Alberta prairies.



Left: Saturday, June 30, was the 50th anniversary of the Calgary Tower, and the whole city was invited to a block party at its base. When it was completed in 1968, it was the tallest structure in western Canada.

Today it isn't even the tallest structure on the block, and is obscured by other skyscrapers. It terminates Centre Street, so the only good view of it is looking down the street.

The block party was mostly food trucks and a two-block lineup for half-price fares for the elevator to the top. I moved to Calgary in 1978 and have never been to the top of the tower.

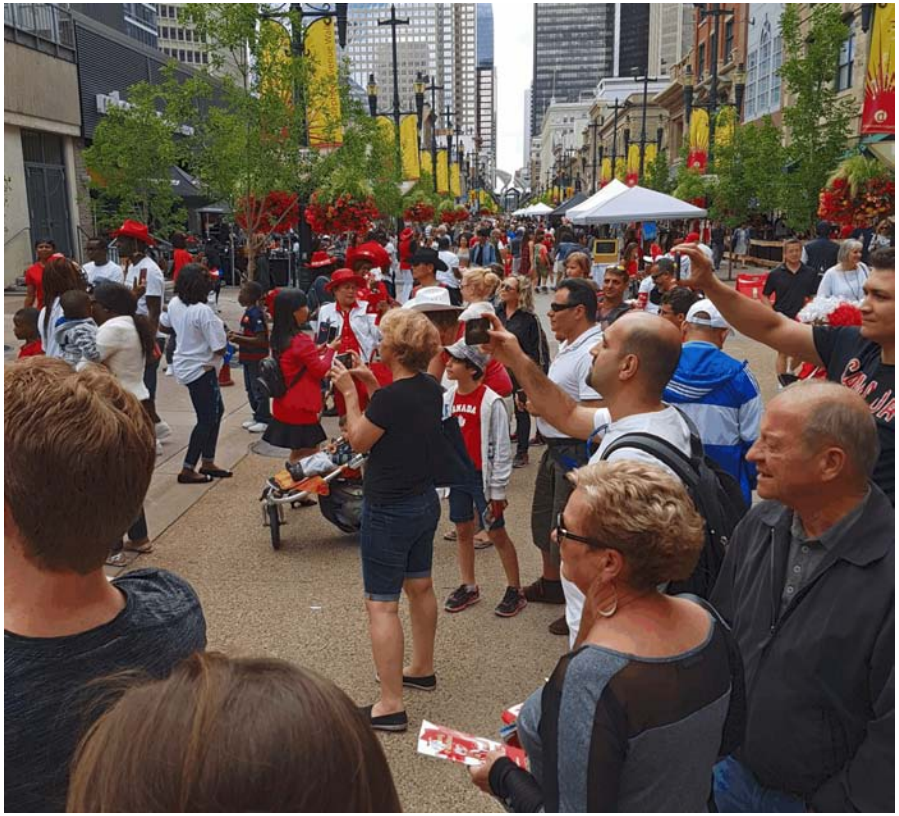
CANADA DAY 2018
photos by Dale Speirs

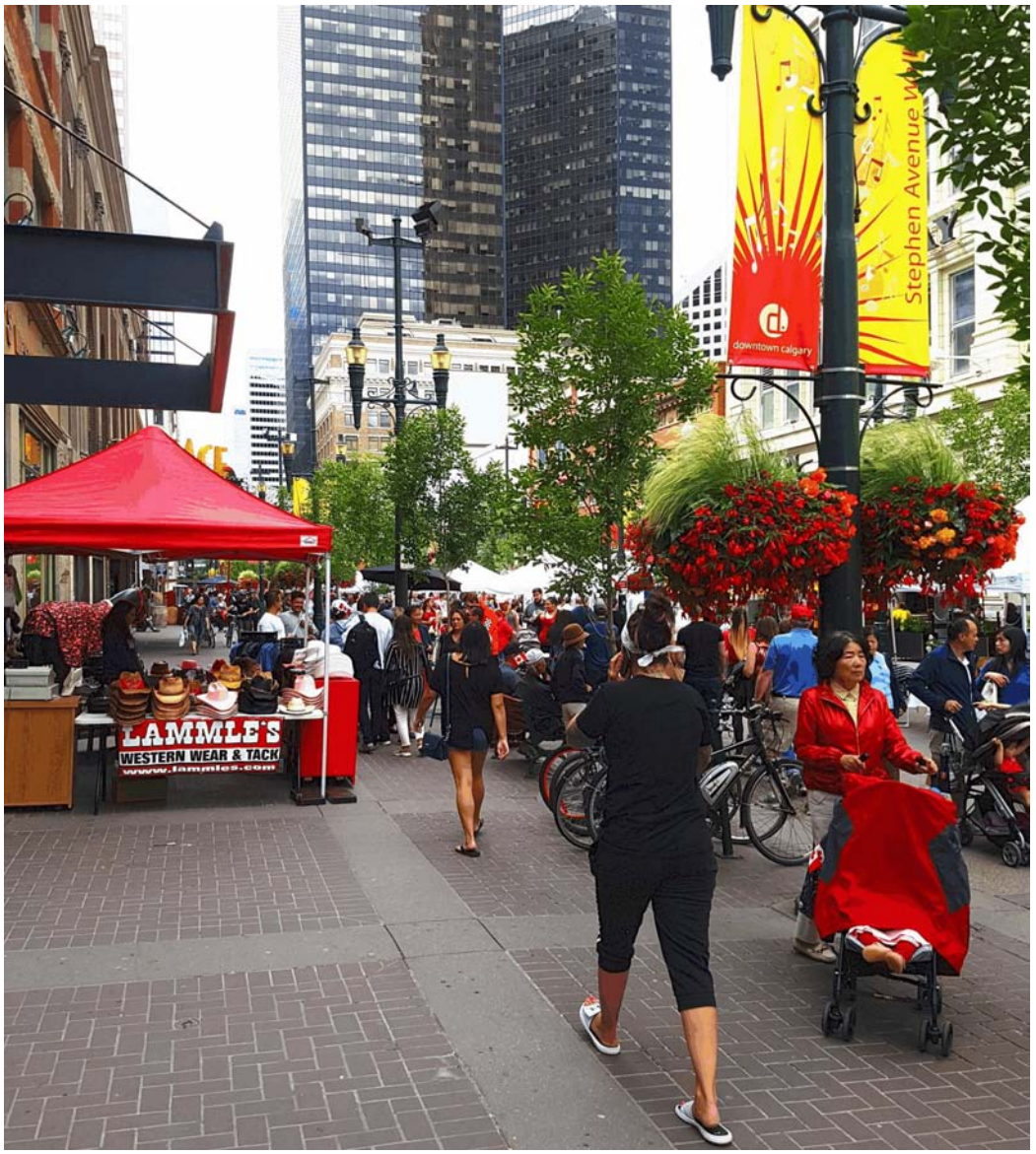
At right: On July 1st, I went downtown, as did several tens of thousands of Calgarians, to celebrate Canada Day. I began at the Olympic Plaza and worked my way around the core in a clockwise direction. The selfie shows me resplendent in my patriotic attire at the plaza.

Below: There were many others dressed for the day.

From Olympic Plaza, which is the eastern terminus of the Stephen Avenue pedestrian mall (8 Avenue South), I walked west. At bottom left, there are obviously performers just outside the photo. It got me thinking about how in the old days, people at rock concerts would hold up their cigarette lighters. Now they hold up the smartphones. As did I, of course.

Bottom: Further along Stephen Avenue mall.





I then turned north on 3 Street SW and headed to Prince's Island in the Bow River. Just before the street terminated at the river, these dancers were waltzing.

Below: Looking across the channel to the island.

Bottom: The Bow River Promenade runs along the south bank of the river from Prince's Island to Fort Calgary, a distance of several kilometres.

Below: Continuing east along the Promenade. A juggler performing in an amphitheatre.

Bottom. Further along was this super-patriotic band. They didn't play very well though, as each instrument was in a different key and tempo.

Thence to Chinatown. This year the Calgary Zoo is hosting the pandas, therefore the street banners.


CALGARY TAICHI & MARTIAL ARTS

Below: The Promenade runs underneath several bridges east of Chinatown. On Reconciliation Bridge there were at least two drivers who weren't going to have a happy Canada Day.

At right: In Fort Calgary Park, a colour guard provided some hearty oom-pah-bah music.

Bottom right: Food trucks were ubiquitous.

PHILATELIC FICTION
by Dale Speirs

Stamp collecting is not commonly a subject for fiction. Almost all of it uses stamps as a MacGuffin, a valuable object to be stolen or pursued, and which could just as easily be diamonds or atomic warheads. There are some interesting variations though.

The radio show THEATER FIVE had a 1965 episode "The Wonderful Stamps From El Dorado", written by Robert A. Arthur. (This and hundreds of other OTR shows are available as free downloads at www.otrrlibrary.org) A man named Murchison inherits a stamp collection from his uncle. In the back of the book is a set of cinderellas from the Federated States of El Dorado. He can't find it on any maps, but shrugs it off, shelves the collection, and forgets about it for years.

One day while writing a letter to his friend Harry in Boston, Murchison decides to have a little fun, and pastes an El Dorado stamp on the envelope. It rises into the air and vanishes out the window. A moment later, Murchison gets a telephone call from Harry, saying that the letter had just floated into his house and dropped in front of him.

The two get together and examine the stamp album. They try an experiment. Using two stamps for each, they post themselves to a restaurant in Paris and arrive instantaneously. As they stand in the street in front of the restaurant congratulating each other, they are accosted by a suspicious gendarme. He demands to see their passports. Not having any, they flee by posting themselves back home.

Better prepared next time, they post themselves to Cairo in care of the American Embassy, wanting to see the pyramids. Unfortunately they arrive as the embassy is besieged by an angry mob protesting against the American government. They barely escape back home by using some more El Dorado stamps.

Third time lucky perhaps, they think, and post themselves to an African jungle resort. Alas, a civil war is underway and they land in the middle of the shooting. So once again, back home. They keep trying and keep failing. The final attempt is a South Pacific island. On arrival they find that the island is ground zero for a hydrogen bomb test, and flee immediately.

There are two stamps left. Harry hits on the idea of going to El Dorado, but only uses one stamp so Murchison can follow him. It will be a one-way trip. Murchison doesn't have the courage to leap out into the unknown. Harry's disappearance does not go unnoticed by friends and family. Murchison is arrested for murder. No one believes his story about the stamps. He uses the last stamp to escape the rap, and vanishes to El Dorado.

"Stamped For Death", written by Elizabeth Pennell, is a 1977 episode of the drama series CBS RADIO MYSTERY THEATER, available as a free mp3 from www.cbsrmt.com A millionaire stamp collector has died, leaving his estate to two quarreling sons and an elderly brother. The millionaire knew his time was coming, and converted his entire holdings into rare stamps. He leaves one stamp, a Brattleboro Provisional, to his brother Morgan and the rest of the collection to his sons Gordon and Jeremy.

The sons don't trust each other, and in any event are not interested in collecting stamps. They want it to be converted into cash, since both are in desperate need of cash. The New York City stamp dealers on Nassau Street seem like the best place to shop the collection around. The men take an airplane to the big city, with the stamp collection stored in the hold. The plane runs into trouble and crashes en route.

The men survive but the stamp collection doesn't, and they lose everything. Returning to the home town, they importune Morgan to share his stamp with him but he refuses. It turns out to be a moot point because an expertizer declared the stamp to be a worthless forgery. Morgan doesn't tell the sons that though, as he and his wife Martha want to tease them for a while.

Morgan doesn't get much chance because the excitement takes him off to the next world to join his brother. Martha succumbs from the shock of Morgan's death and is not far behind to the grave. Gordon and Jeremy frantically search the house for the Brattleboro Provisional. They will never find it.

Postal Affairs.

DEATH TAKES PRIORITY (2015) by Jean Flowers (pseudonym of Camille Minichino) is the first installment in a mystery series about Cassie Miller, postmaster of North Ashcot, Massachusetts. She was previously a manager in the main Boston post office. Her personal life became a mess, so she returned to the village of her birth and took over the post office.

Events begin when she arrives at work one morning and discovers that someone had entered the post office during the weekend and stolen 200 telephone directories. Nothing else was taken. The mystery is why anyone would want a stack of books that most recipients will immediately toss into the recycle bin, this being the age of Google.

Local antiques dealer Scott James, upon whom Miller has romantic designs, is arrested after the body of Wendell Graham is found in nearby woods. He once was a boyfriend of Miller back in high school. As is often the case in rural villages, the post office is Gossip Central, so Miller hears all the rumours and innuendoes. She is annoyed, however, that none of the loiterers are buying stamps or mailing express packages.

The police find the missing phone books in James's apartment, and learn that his real name is Quinn Martindale. A while later, Miller is sorting mail when she comes across a letter addressed to Martindale. She is in a quandary as to how it should be delivered, to him or the police. A moot point, because Martindale qua James is released for lack of evidence.

She does get the phone books back for delayed delivery. Martindale had stolen them because his picture and name had been used in a display ad without his permission by his boss. He had a lot in his past to hide, and feared the wrong person might notice the ad. Graham's sister Wanda asks Miller for help, so she becomes a Miss Marple. In between her snooping, she still has a post office to run. There are vignettes of the common problems posties have in dealing with customers, some of whom are eccentric and others who are boorish.

The plot complicates itself. There was a local and entirely illegal betting operation in the village that Graham had been mixed up in. A politician tries to silence Miller by attacking her inside the post office (which makes it a federal offence) and is foiled. The loose threads are tied up, and it's back to the mundane job of sorting mail.

WE'LL ALL GO TOGETHER WHEN WE GO: PART 9

by Dale Speirs

[Parts 1 to 8 appeared in OPUNTIAs #249, 276, 283, 301, 312, 327, 343, and 365.]

Comets.

In human history, comets have often struck terror or awe into the minds of people, depending on how good their priests were about interpreting them either as a sign of doom or of imminent victory for the glorious cause.

"The Comet" by K. Raymond (1937 February, ASTOUNDING) is about two explorers in a remote area who track down a comet impact. It arrived 77 years prior and landed somewhere in Belgian Congo. Now a professor and his helper have found its crater deep in the jungle.

To their surprise, the comet survived intact. Not only that, it appears to be a gigantic living organism, a sphere that might be a seed not yet germinated. As they descend the crater walls, they slip and fall inside the comet. It is definitely a living organism but it is not well.

The professor is killed by the comet's equivalent of white blood cells but the narrator survives even as the comet dies. It goes blooey because all those Earth organisms falling into its crater are its equivalent of pathogens, bringing it disease and a long lingering death. A nice twist about bolides.

THE YEAR WHEN STARDUST FELL (1958) is a novel by Raymond F. Jones about the passage of a doomsday comet. (Available as a free download from www.gutenberg.org). A giant comet is making a close approach past Earth, and our planet will pass through its tail over an extended period of time. The story is set in contemporary times, focused on the small college town of Mayfield. Most of the main characters are teenagers or young adults.

The comet has brought all the doomsayers out, but generally the populace ignore them. The view of the comet is spectacular, filling the night sky and lighting it as the day. Not long after Earth begins passing through the tail, motor vehicles begin breaking down. Something is clogging internal combustion engines and mechanics don't know how to repair them. It doesn't take long to discover the problem. Crankshaft bearings are fusing solid, and pistons are welding into the cylinders.

More worrisome is that electrical generators run on bearings. Or, rather, they aren't, seizing up the turbines. Power failures begin to spread. It's happening all over Earth. Very quickly, everyone's world dwindles to their home town and the distance they can walk in a day. Horses and cattle are worth their weight in gold.

The planet reverts to a medieval village economy, where the majority of people never go over the hill into the next valley during their lives. The collapse of civilization is rapid. City dwellers depend on rural food. Police need rapid transportation and radios to extend their reach; without them, they are nothing more than village night watchmen.

The scientists are able to determine that the comet dust attaches itself to all metals and loosens the surface molecules. For moving parts, this means friction that eventually melts the parts together. Then anthrax breaks out and infects the livestock. There isn't enough vaccine in the area to protect all the animals and with communications shut down, no way of obtaining more. Influenza hits the humans, and the mobs arrive, burning and looting.

Finally a solution, projectors that beam ultrasound up into the atmosphere and cause the comet dust to settle out. It will take a long time to cleanse the atmosphere, and even longer to rebuild the cities. It was bad enough in rural areas, but the majority of humans lived in cities. The rule of thumb (then and now) is that cities only have a three day supply of food.

The novel ends on an optimistic note. Civilization will rebuild.

A Miss Is Not As Good As A Mile.

MOONCALF (1998) is a novel by Jack Modesitt about an inbound bolide, the comet Tomiki. Its impact is predicted not on Earth but for the Moon. Not just close enough for horseshoes and government work, but for the end of the world as we know it, since big chunks of the Moon will fall into the nearest gravity well, ie, Earth.

Like most such novels, this one begins slow as the subplots are set up and the background filled in with infodumps. A comet has been discovered, belatedly because it was hidden by the Sun's glare. It is big, traveling very fast from outside the Solar System (not the Oort Cloud), and will be a doomsday impactor. It will reach the Moon in a week.

Comet Tomiko will smack into the Moon hard. The chunks raining down will be city-smasher pieces. If they fall into the ocean, as they have a 75% chance of doing, the tsunamis will scrub clean the coast lines around the world and reach far inland. Not an extinction level event, but small consolation to the dead and injured, numbering hundreds of millions.

One scientist tells a newshen: "*We tend to forget, because our lives are very short and nothing around us ever seems to change, that the universe is really a very violent place. It's not necessarily a bad thing that we be reminded of that periodically.*"

Colonization of the Moon had begun, and the first task was to evacuate the 700+ personnel up there. They're not all going to make it; there aren't enough shuttles and time to evacuate. Simultaneously, several hundred million people living along the coasts of the planet all figure out at the same time what the odds are, and decide they'd have a better chance inland and at a higher altitude. You can guess the next part of the story. I'm glad I live in Calgary, 1.5 km above sea level, protected by mountains to the west, and well inside the continent.

Then the impact: "*Where the Moon had been, there was now a blood-red cloud, lit by inner fires.*" After that, debris raining down on Earth. The rocks cried out, there's no hiding place from us. Tsunamis begin rolling in, one after another. The good news, for Americans at least, is that the IRS announced a one-week extension of the income tax deadline: "*transportation, communication difficulties cited.*" A good time to own silver coins.

There is one last disaster, a big chunk of the Moon inbound for Kansas, which will take out the USA between the Rockies and Atlantic coast. It'll make the Yellowstone supervolcano look like a toy popgun. A fleet of spacecraft head out on a one-way mission to nudge it off course and deflect it away from Earth. They succeed with three pages to go.

The novel depicts the human chaos on Earth very well. The science, albeit with more manned spacecraft than we are likely to have, is realistic. All told, a good action-adventure story.

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 V23#3+ (Sample copy US$5 from Catherine Groves, Box 276, Clifton, New Jersey 07015-0276) Essays and letters of comment on a variety of topics. Robert Arias writes about the different religions (Christian, Islam, Buddhism, etcetera) from a different point of view, using Godel's Theorem. I haven't seen that one before but it does make an interesting analysis. If each religion is subject to Godel's Theorem in the same way as mathematical systems, then the conclusions are thought provoking.

SEEN IN THE LITERATURE

Ellery, A.A. (2018) **Engineering a lunar photolithoautotroph to thrive on the Moon: life or simulacrum?** INTERNATIONAL JOURNAL OF ASTROBIOLOGY 17:258-280

Author's abstract: *Recent work in developing self-replicating machines has approached the problem as an engineering problem, using engineering materials and methods to implement an engineering analogue of a hitherto uniquely biological function. The question is: can anything be learned that might be relevant to an astrobiological context in which the problem is to determine the general form of biology independent of the Earth.*

Compared with other non-terrestrial biology disciplines, engineered life is more demanding. Engineering a self-replicating machine tackles real environments unlike artificial life which avoids the problem of physical instantiation altogether by examining software models. Engineering a self-replicating machine is also more demanding than synthetic biology as no library of functional components exists. Everything must be constructed de novo.

Biological systems already have the capacity to self-replicate but no engineered machine has yet been constructed with the same ability; this is our primary goal. On the basis of the von Neumann analysis of self-replication, self-replication is a byproduct of universal construction capability, a universal constructor is a machine that can construct anything (in a functional sense) given the appropriate instructions (DNA/RNA), energy (ATP) and materials (food).

In the biological cell, the universal construction mechanism is the ribosome. The ribosome is a biological assembly line for constructing proteins while DNA constitutes a design specification. For a photoautotroph [photosynthetic algae or plant]*, the energy source is ambient and the food is inorganic. We submit that engineering a self-replicating machine opens up new areas of astrobiology to be explored in the limits of life.*

Gaynor, K.M., et al (2018) **The influence of human disturbance on wildlife nocturnality.** SCIENCE 360:1232-1235

Authors' abstract: *Rapid expansion of human activity has driven well-documented shifts in the spatial distribution of wildlife, but the cumulative effect of human disturbance on the temporal dynamics of animals has not been quantified. We examined anthropogenic effects on mammal diel activity patterns, conducting a meta-analysis of 76 studies of 62 species from six continents.*

Our global study revealed a strong effect of humans on daily patterns of wildlife activity. Animals increased their nocturnality by an average factor of 1.36 in response to human disturbance. This finding was consistent across continents, habitats, taxa, and human activities. As the global human footprint expands, temporal avoidance of humans may facilitate human-wildlife coexistence. However, such responses can result in marked shifts away from natural patterns of activity, with consequences for fitness, population persistence, community interactions, and evolution.

Munoz, S.E., et al (2018) **Climatic control of Mississippi River flood hazard amplified by river engineering.** NATURE 556:95-98

Authors' abstract: *Engineering modifications to the Mississippi River system have altered the river's sediment levels and channel morphology, but the influence of these modifications on flood hazard is debated. Detecting and attributing changes in river discharge is challenging because instrumental streamflow records are often too short to evaluate the range of natural*

hydrological variability before the establishment of flood mitigation infrastructure.

Here we show that multi-decadal trends of flood hazard on the lower Mississippi River are strongly modulated by dynamical modes of climate variability, particularly the El Niño-Southern Oscillation and the Atlantic Multidecadal Oscillation, but that the artificial channelization (confinement to a straightened channel) has greatly amplified flood magnitudes over the past century.

Our results, based on a multi-proxy reconstruction of flood frequency and magnitude spanning the past 500 years, reveal that the magnitude of the 100-year flood (a flood with a 1 per cent chance of being exceeded in any year) has increased by 20 per cent over those five centuries, with about 75 per cent of this increase attributed to river engineering. We conclude that the interaction of human alterations to the Mississippi River system with dynamical modes of climate variability has elevated the current flood hazard to levels that are unprecedented within the past five centuries.

de Barros Damgaard, P., et al (2018) **The first horse herders and the impact of early Bronze Age steppe expansions into Asia.** SCIENCE 360:doi.10.1126/science.aar7711

Authors' abstract and extracts: *The Eurasian steppes reach from the Ukraine in Europe to Mongolia and China. Over the past 5000 years, these flat grasslands were thought to be the route for the ebb and flow of migrant humans, their horses, and their languages. ... Although there is evidence for migration into Europe from the steppes, the details of human movements are complex and involve independent acquisitions of horse cultures. Furthermore, it appears that the Indo-European Hittite language derived from Anatolia, not the steppes. The steppe people seem not to have penetrated South Asia. Genetic evidence indicates an independent history involving western Eurasian admixture into ancient South Asian peoples.*

According to the commonly accepted steppe hypothesis, the initial spread of Indo-European (IE) languages into both Europe and Asia took place with migrations of Early Bronze Age Yamnaya pastoralists from the Pontic-Caspian steppe. This is believed to have been enabled by horse domestication, which revolutionized transport and warfare.

Although in Europe there is much support for the steppe hypothesis, the impact of Early Bronze Age Western steppe pastoralists in Asia, including Anatolia and South Asia, remains less well understood, with limited archaeological evidence for their presence. Furthermore, the earliest secure evidence of horse husbandry comes from the Botai culture of Central Asia, whereas direct evidence for Yamnaya equestrianism remains elusive.

Our findings reveal that the early spread of Yamnaya Bronze Age pastoralists had limited genetic impact in Anatolia as well as Central and South Asia. As such, the Asian story of Early Bronze Age expansions differs from that of Europe. Intriguingly, we find that direct descendants of Upper Paleolithic hunter-gatherers of Central Asia, now extinct as a separate lineage, survived well into the Bronze Age. These groups likely engaged in early horse domestication as a prey-route transition from hunting to herding, as otherwise seen for reindeer.

Our findings further suggest that West Eurasian ancestry entered South Asia before and after, rather than during, the initial expansion of western steppe pastoralists, with the later event consistent with a Late Bronze Age entry of Indo-European languages into South Asia. Finally, the lack of steppe ancestry in samples from Anatolia indicates that the spread of the earliest branch of Indo-European languages into that region was not associated with a major population migration from the steppe.

Gong, S., et al (2009) **Millennium-old farm breeding of Chinese softshell turtles (Pelodiscus spp.) results in massive erosion of biodiversity.** SCIENCE OF NATURE 105:doi.org/10.1007/s00114-018-1558-9

Authors' abstract: *Chinese softshell turtles (Pelodiscus spp.) are widely distributed, ranging from the Amur and Ussuri Rivers in the Russian Far East through the Korean Peninsula, Japan, and eastern, central, and southern China to southern Vietnam. In East and Southeast Asia, Chinese softshell turtles are traditionally exploited for food and have been farm-bred in China since the Spring and Autumn Period, more than 2400 years ago. Currently, the annual production of Pelodiscus amounts to 340,000 tonnes in China alone.*

Using mitochondrial DNA (2428 bp) and five nuclear loci (3704 bp), we examined broad sampling of wild and farm-bred Pelodiscus to infer genetic and taxonomic differentiation. We discovered four previously unknown

mitochondrial lineages, all from China. We also discovered evidence for hybridization in turtle farms and for the occurrence of alien lineages in the wild (Zhejiang, China), highlighting the risk of genetic pollution of native stock.

In the face of the large-scale breeding of Pelodiscus, we claim that the long-term survival of distinct genetic lineages and species can only be assured when an upscale market segment for pure-bred softshell turtles is established, making the breeding of pure lineages lucrative for turtle farms. Our findings underline that the diversity of Pelodiscus is currently underestimated and threatened by anthropogenic admixture. We recommend mass screening of genetic and morphological variation of Chinese softshell turtles as a first step to understand and preserve their diversity.

Olson, M.H., et al (2018) **Landscape-scale regulators of water transparency in mountain lakes: implications of projected glacial loss.** CANADIAN JOURNAL OF FISHERIES AND AQUATIC SCIENCES 75:169-1176

Authors' abstract: *We examined factors regulating water transparency in a set of 33 lakes located in the Canadian Rocky Mountains. Eighteen lakes had catchments that included glaciers and 15 did not.*

In each lake, we quantified midsummer attenuation rates for three ultraviolet wavelengths and photosynthetically active radiation and measured chromophoric dissolved organic matter (CDOM) absorbance, turbidity, and chlorophyll a fluorescence. We also used GIS to quantify characteristics of lake catchments.

Across lakes, turbidity and CDOM absorbance were arrayed on orthogonal gradients that intersected in a region of low turbidity and low CDOM absorbance. Nonglacially fed lakes had low turbidity and attenuation rates were regulated by CDOM absorbance, which increased with the percentage of the catchment covered by vegetation.

Glacially fed lakes had low CDOM absorbance and attenuation rates increased with turbidity, which increased with the percentage of the catchment covered by permanent ice. Glaciers are retreating rapidly in the Canadian Rockies. As catchments become deglaciated, turbidity will likely decrease and the regulator of lake transparency is likely to switch to CDOM, which will have broad implications for lake ecosystems.

Bar-On, Y.M., et al (2018) **The biomass distribution on Earth.** PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES USA 115:6506-6511

[An order of magnitude is a multiple of ten times a lower number. Two orders is 100 times, etcetera.]

Authors' abstract: *Here, we assemble the overall biomass composition of the biosphere, establishing a census of the ˜550 gigatons of carbon (Gt C) of biomass distributed among all of the kingdoms of life. We find that the kingdoms of life concentrate at different locations on the planet; plants (˜450 Gt C, the dominant kingdom) are primarily terrestrial, whereas animals (˜2 Gt C) are mainly marine, and bacteria (˜70 Gt C) and archaea (˜7 Gt C) are predominantly located in deep subsurface environments.*

We show that terrestrial biomass is about two orders of magnitude higher than marine biomass and estimate a total of˜6 Gt C of marine biota, doubling the previous estimated quantity. Our analysis reveals that the global marine biomass pyramid contains more consumers than producers, thus increasing the scope of previous observations on inverse food pyramids.

Finally, we highlight that the mass of humans is an order of magnitude higher than that of all wild mammals combined and report the historical impact of humanity on the global biomass of prominent taxa, including mammals, fish, and plants.

David E. Levari, D.E., et al (2018) **Prevalence-induced concept change in human judgment.** SCIENCE 360:1465-1467

Authors' abstract: *Do we think that a problem persists even when it has become less frequent? Levari et al. show experimentally that when the "signal" a person is searching for becomes rare, the person naturally responds by broadening his or her definition of the signal, and therefore continues to find it even when it is not there. From low-level perception of color to higher-level judgments of ethics, there is a robust tendency for perceptual and judgmental standards to "creep" when they ought not to.*

When blue dots became rare, participants began to see purple dots as blue; when threatening faces became rare, participants began to see neutral faces as

threatening; and when unethical requests became rare, participants began to see innocuous requests as unethical.

This "prevalence-induced concept change" occurred even when participants were forewarned about it and even when they were instructed and paid to resist it. Social problems may seem intractable in part because reductions in their prevalence lead people to see more of them.

Speirs: This explains the old proverb that to someone with a hammer, everything looks like a nail.

Kilaj, A., et al (2018) **Observation of different reactivities of para and ortho-water towards trapped diazenylium ions.** NATURE COMMUNICATIONS 9:doi:10.1038/s41467-018-04483-3

Authors' abstract: *Water is one of the most fundamental molecules in chemistry, biology and astrophysics. It exists as two distinct nuclear-spin isomers, para- and ortho-water, which do not interconvert in isolated molecules. The experimental challenges in preparing pure samples of the two isomers have thus far precluded a characterization of their individual chemical behavior.*

Capitalizing on recent advances in the electrostatic deflection of polar molecules, we separate the ground states of para- and ortho-water in a molecular beam to show that the two isomers exhibit different reactivities in a prototypical reaction with trapped diazenylium ions. Based on ab initio calculations and a modelling of the reaction kinetics using rotationally adiabatic capture theory, we rationalize this finding in terms of different rotational averaging of ion-dipole interactions during the reaction.

Considering the different properties of its two nuclear-spin isomers and the eminent importance of water in a variety of chemical contexts, it begs the question whether para- and ortho-water also show different chemical behavior. In a wider context, this problem ties into ongoing efforts to understand how different molecular degrees of freedom (translation, nuclear spin, rotation, vibration, electronic motion) and the interplay between them influence chemical reactivity.

We found a 23(9)% higher reactivity for the para nuclear-spin isomer which we attribute to the smaller degree of rotational averaging of the ion-dipole longrange interaction compared to the ortho-species. The observed difference in reactivities is thus a rotational effect which is induced by the nuclear-spin symmetry via the generalized Pauli principle.

Speirs: Not to worry. They aren't Ice-9 or polywater (see OPUNTIA #70.1F).

Ram, N., et al (2018) **Genealogy databases and the future of criminal investigation.** SCIENCE 360:1078-1079

Authors' abstract: *The 24 April 2018 arrest of Joseph James DeAngelo as the alleged Golden State Killer, suspected of more than a dozen murders and 50 rapes in California, has raised serious societal questions related to personal privacy. The break in the case came when investigators compared DNA recovered from victims and crime scenes to other DNA profiles searchable in a free genealogical database called GEDmatch.*

This presents a different situation from the analysis of DNA of individuals arrested or convicted of certain crimes, which has been collected in the U.S. National DNA Index System (NDIS) for forensic purposes since 1989. The search of a nonforensic database for law enforcement purposes has caught public attention, with many wondering how common such searches are, whether they are legal, and what consumers can do to protect themselves and their families from prying police eyes. Investigators are already rushing to make similar searches of GEDmatch in other cases, making ethical and legal inquiry into such use urgent.