

OPUNTIA

388

Solar Eclipse 2017

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

ROCKY MOUNTAIN WAY: PAINT POTS

photos by Dale Speirs

As part of my July 4 excursion along Highway 93 through Kootenay National Park, I stopped off at the Paint Pots. This is a rare iron oxide deposit; almost all the Rockies are limestone, dolomite, shale, or sandstone. The appropriately named Ochre Creek arises from springs at the mother lode of the iron deposit, and has for centuries been eroding the material down into the bottomlands.

The view at right is at the trailhead. The path follows the creek up to its source a couple of kilometres away. It is an easy walk with a mild slope, compared to most of the 45°-angle trails I hike.

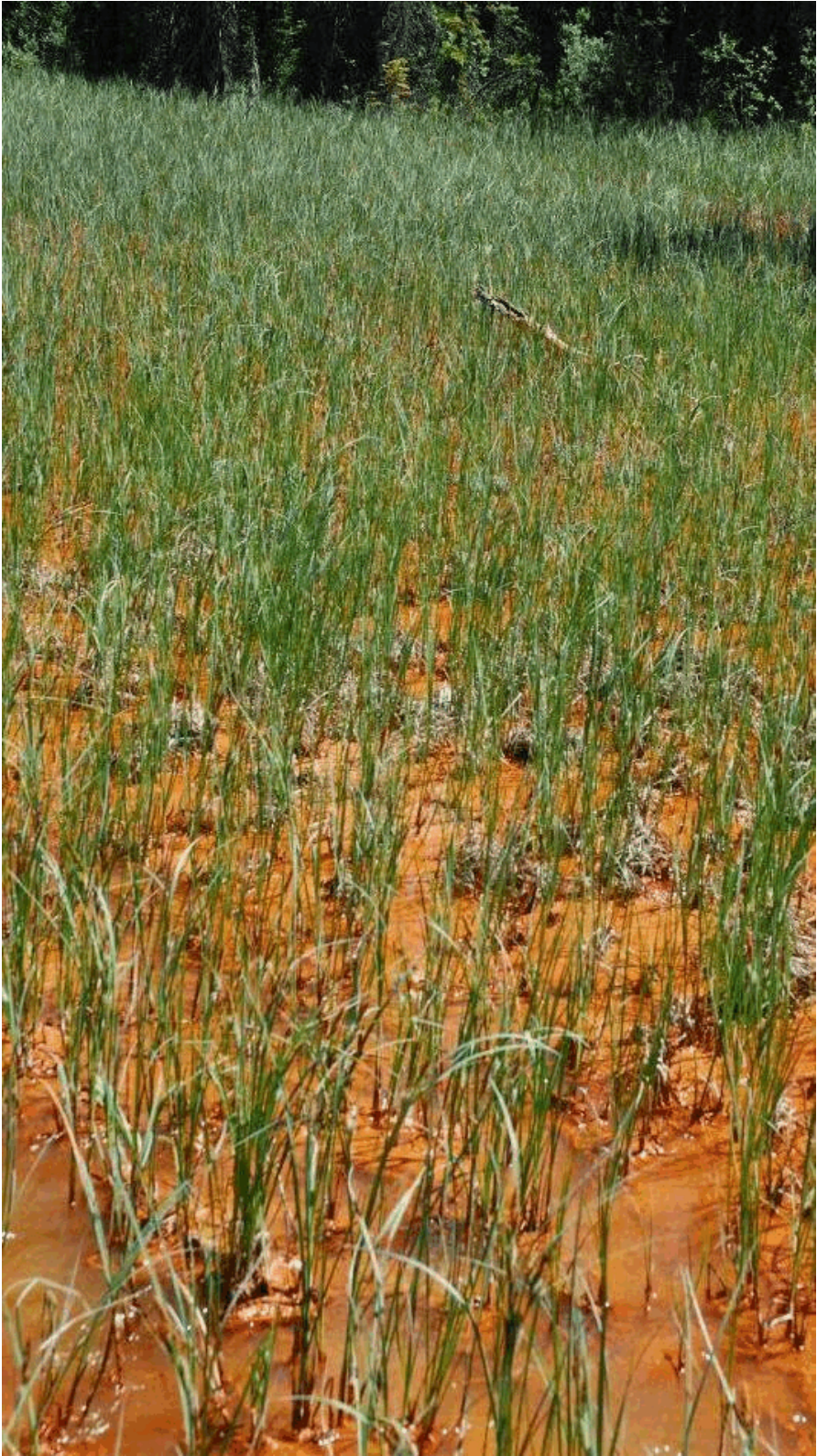


Because the ochre deposits are washed down to the Vermilion River flats, the aboriginal tribes soon discovered them. For centuries the ochre was collected and traded out onto the prairies for face paint. Mixed with animal fat, it made good makeup.

European settlers also made use of the ochre. In the pioneer days before the transcontinental railroad came through, it was the standard red pigment for locally-made house and wagon paint, as well as for cloth dyeing. Miners dug out the ochre with horses pulling scoops, bagged the ochre by hand, and then hauled it by wagon to the towns out on the prairies. After the railroad came through, they couldn't compete with properly manufactured paints that were far superior in quality and much cheaper. The equipment was abandoned in place, and is still there 110 years later.



From a distance, the meadows look like any dry pasture anywhere, but up close one can see this isn't grass, it is sedge growing in orange muck. I imagine that both aboriginals and settlers digging out ochre would end up as orange humans, not redskins or whites.



Ochre Creek doesn't so much flow as it oozes.



These springs are the source of the creek. The centres are quicksand. No fences, since the law says anyone hiking in wilderness accepts the hazards. Or to put it another way, natural selection is still in action.



Vermilion River just upstream of Ochre Creek. Very fine glacial sediments in the water cause its opaque milky blue colour.

I didn't photograph it but the outflow of Ochre Creek into the river is quickly swamped by the blue water, so there is no orange tinge past the junction.



LITERA SCRIPTA MANET AND MAGAZINES OF YORE: PART 8
by Dale Speirs

[Parts 1 to 7 appeared in OPUNTIA's #365, 366, 368, 371, 373, 375, and 379.]

Back in 1980, Calgary had half the population of today and dozens of secondhand bookstores. Today it has one secondhand bookstore. I used to make the rounds every weekend of the better stores and that year I bought the first six issues of THE NEW NATURALIST, a British journal published 1948-49 by Collins of London. They also published a series of book guides to flora and fauna under the same title. Each issue of TNN the magazine was devoted to a particular theme of British natural history.

I know what year I bought the issues of TNN because I inscribed my name and date on the flyleaf, beside that of the previous owner. The name of the latter is illegible and the date almost so; I think it is 1961. Will the next owner add his name? Or will it go into a blue bin because the next generation only reads on tablets and smartphones?

TNN was published in a peculiar manner. The first four issues were never produced separately but sold together as a single hardcover book. Nor did the publisher date it. The next two issues are the regular style of magazine, with paper covers and squareback bindings, issued in sequence. They conclude all that I have. Continuing previous practice, albeit slightly improved, they are vaguely dated. Issue #5 is Spring 1949, so that tells me the bound volume of the first four issues must be from 1948. Issue #6 is again undated but the editorial refers to it as another Summer issue, so it must be 1949.

Issue #1

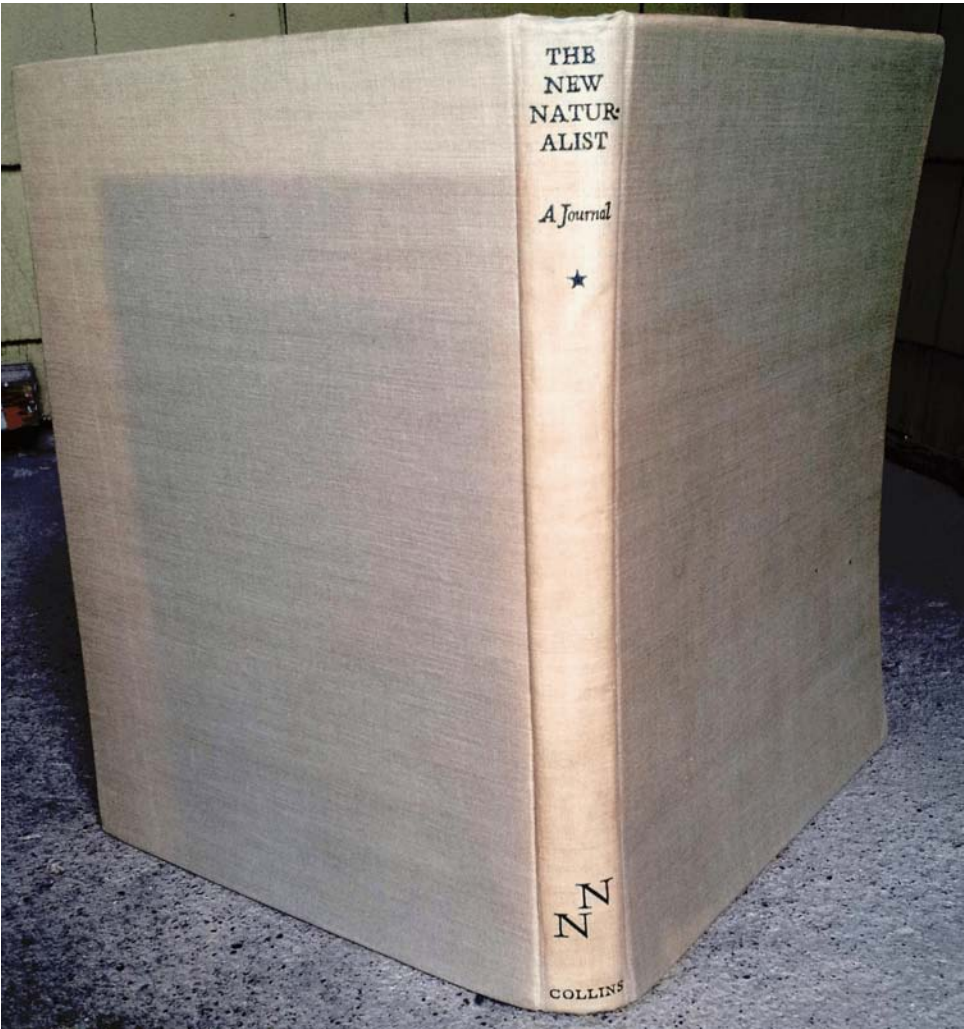
The first quarter of the book, unnumbered but Issue #1 (didn't anyone at Collins know the slightest thing about production design?) is devoted to the trees and fauna of British woodlands. I found this more interesting than I thought it would be, because there are no natural forests left in Britain after millennia of human occupation.

All British forests are actually woodlands that resprouted after logging over or were replanted with non-native species. The original forests were cut down for wood and to grow crops, and when the land was abandoned the tree species that grew back were mixtures of native and introduced trees. This contrasts with

Canada, where vast areas of land are still untouched. Not 100 km from my house, there are natural forests where no human, aboriginal or European, has set foot.

One of the articles discusses the use of palynology, the study of pollen and spores, to track the changes in the British flora. By taking vertical cores in deep sediment or peat bogs, then analyzing the pollen and spores at each level, one can get a history of the land.

In the immediate post-glacial era, Britain was covered with birches and some pines. They gave way to widespread oaks and alders, while hazel shrubs exceeded the trees and blanketed large parts of Britain. The pollen counts changed with climate and the arrival of humans.



Different tree species rose and fell in local areas as humans harvested them or planted them, until the past few centuries when no area of Britain could be considered natural. Even the remote Scottish isles were altered, first denuded of their trees, then their herbaceous species altered by intensive sheep grazing.

Other articles discuss the changes in British fauna, mostly due to land clearing, crop cultivation, and introduction of foreign species such as grey squirrels. Butterflies and birds expanded and contracted their ranges with climate and agriculture. Climate change is nothing new but it is politically incorrect to mention that in public.

Issue #2

Again unnumbered and undated, the theme of this issue is the natural history of the Scottish isles. These islands had their ecology dramatically changed by humans. Not just sheep, but the introduction of rats, which wiped out many species of birds. Hunting for food and sport wiped out many species, which had no refugia from which to restock their numbers.

Island ecology is a specialty in its own right, because the effects of extinction and expansion are magnified. Some were preserved as habitats for seabirds because they were too dangerous to approach by boat due to jagged reefs and soaring cliffs that made landings impossible.

The Scottish isles were also noted for microevolution. Field mice of one species nonetheless varied slightly from one island to the next. The house mouse was dependent on humans. When most of the islands were depopulated by humans in the 1930s, field mice carried on but house mice quickly became extinct.

Issue #3

The theme of this ‘issue’ is animal migration. Birds and butterflies migrate in ways that were not understood until the 1900s. One article discusses bird banding, the original impetus for which was to find how they travel. It also turned out to be a method of determining life spans in habitat. Many bird species are known to survive decades in captivity. Those same species, when cross-checked by bands, have an average life of two years in the wild. Allowing for one year to grow to maturity, this means the average bird is lucky to reproduce more than once.

The final article, “The Last Hundred Bird Books” by James Fisher, complains about the flood of bird books inundating Britain back then. The postwar surge in birdwatching and banding prompted publishers to churn out books to capture the market. Fisher surveyed the books and concluded that only half were sound, and the rest a waste of paper and the customer’s money. The first few books had been carefully researched and written. Once publishers realized the size of the market, they jumped in with hack-written books copied out of each other.

I got to thinking how that paralleled other markets. A few good science fiction movies were released in the early 1950s, to be lost in the subsequent barrage of monster and UFO invasion films that gave science fiction a bad name among mundanes. Stamp collectors had a similar problem when tropical islands and banana republics realized they could make big bucks printing stamps that would never be used for postage.

Issue #4

This installment discusses the local naturalist. Wildlife observation, properly done, is one of the few areas of science where amateurs can make useful contributions, even today. Professional botanists and zoologists can’t possibly cover more than a fraction of the land for ecological studies. Local naturalist societies, on the other hand, can pick a county or small geographical unit and observe the flora and fauna in great detail over a long period of time.

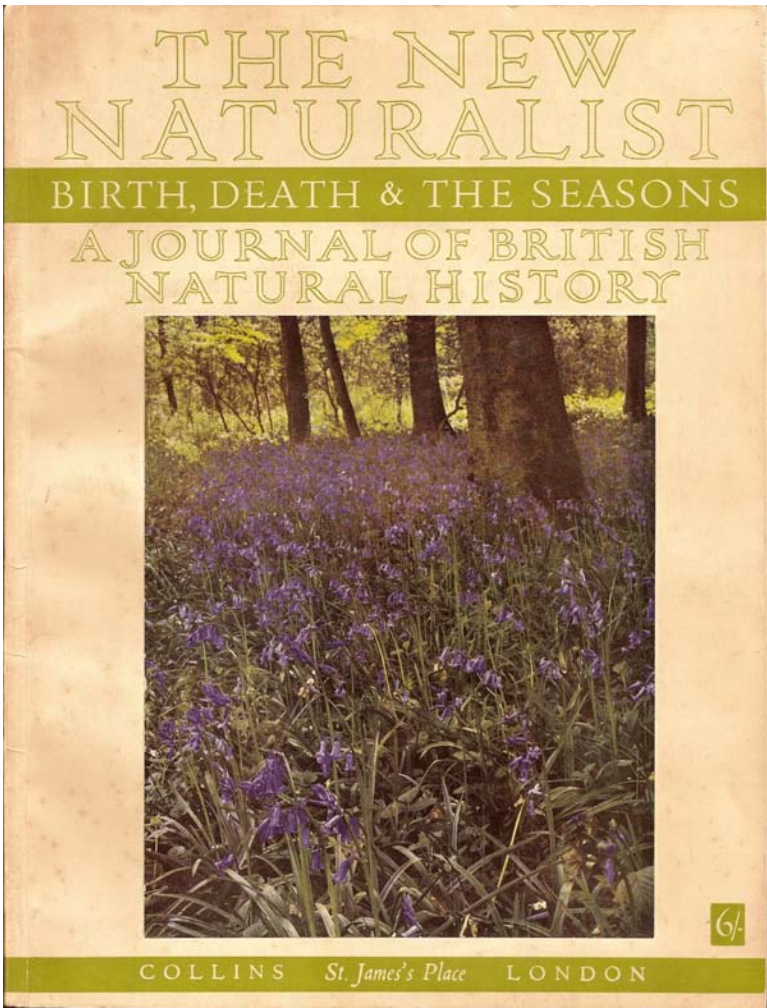
Those results form the raw data that university scientists can then collate. This is similar to amateur astronomers, who can watch more of the skies than a professional. You can’t make any contribution to particle physics as an amateur, but with a telescope at hand, you can spot more comets than a professional.

Issue #5

To everything there is a season, which is the theme of this issue. Phenology, the science of flowering times, is one activity that I used to be active in as a professional horticulturist. Because seasons fluctuate, an early warm spring one year and a cold wet one the next, flowers and bud openings also vary. However, the order in which species bud out or flower stays the same. This was noticed early on by farmers, who long ago calculated that to sow a specific crop could be done with greater safety if it were done x number of weeks after a particular tree species opened its buds, rather than going by the calendar.

In Calgary, to take an example which we in the Parks Dept. knew well, the first mass bloom of dandelions set the schedule for our activities. The first seasonal mowing of park turf could be as early as middle April or as late as Victoria Day, but it was always when the dandelion bloom reached its maximum.

At the time the dandelions finished blooming, the cottonwoods would release fluff, and the citizen complaints would begin. (To which we replied, "Tough luck", although not in those exact words.) As the fluff finished blanketing the city, foxtail barley began blooming, which triggered a round of calls from dog owners whose pets had got a face full of spearing seeds. Next up were the Canada thistles, going to seed as the foxtail barley faded away. And so on through the season.



Getting back to the issue at hand, it discusses the breeding seasons of various British animals, hibernation, and the spread of plants as the summer progresses.

The biology of the seasons is another area where amateurs can excel. It is surprising how few animal life cycles have been actually observed in the field. Most learned reports on how animals breed are based on laboratory specimens or

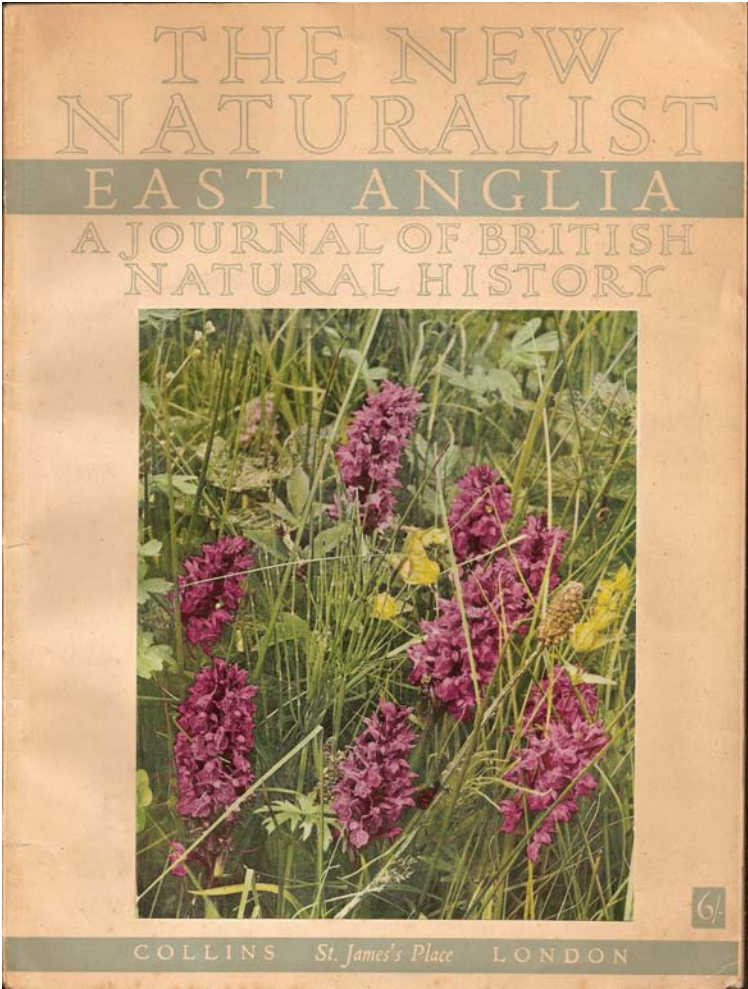
wild surmise. Only an amateur naturalist can devote the time necessary to watch obscure species reproduce and spread.

Issue #6

This one is devoted to the coastal ecology of East Anglia, certainly an alien world to me. The sandbars and beaches constantly move about. Marshes are killed off by saltwater floods from storms, then slowly revive. There is little natural terrain left here because of all the groins, dredging, and channelization of rivers.

Sand dunes and shingle bars block the harbours or disappear in storms. Historians have to take note because an event that happened centuries ago at a coastal location may now be far inland due to siltation. The reverse is true also, as storm surges change the course of a river and the economy of the locality.

All told, these six issues are a fascinating glimpse of a strange world much removed from my prairies and mountains. In particular, it is instructive how British natural areas are the result of human activities, not original nature.



BWAH HA! HA!: PART 4

by Dale Speirs

[Parts 1 to 3 appeared in OPUNTIA's #371, 372, and 378.]

Atomic Universes.

At the turn of the previous century, physicists were still groping their way into quantum mechanics and particle theory. The initial belief was that atoms were a nucleus with electrons buzzing around them in orbits like planets around a star.

It didn't take SF writers long to latch onto this idea. Through the 1920s and 1930s, there was a subgenre of stories about people being shrunk down to subatomic size and having adventures on an electron-size planet. I mentioned a few of them in Part 2 of this series, but keep finding more stories. The vast majority are Bat Durston stories, where a mundane story is placed on an electron planet, usually fantasy with the hero rescuing a fair maiden from an evil kingdom or a western where the hero rides into town and does what a man's gotta do.

"Out Of The Sub-Universe" by R.F. Starzl appeared in AMAZING STORIES QUARTERLY of the 1928 Summer issue. The scientist, with the usual beautiful nubile daughter and handsome laboratory assistant, has developed a device that will miniaturize down to the electron level. Shirley and Hale, as the two young people are, volunteer to travel down to that world. The scientist will bring them back one hour after launch.

When the time comes, he instead retrieves a crowd of strange humans who are apparently the descendants of Shirley and Hale generations later. What the scientist miscalculated was that since an electron spins about the atom so fast, time moves quicker there than on Earth, so as an hour passes here, countless years pass there. He will never again see his beloved daughter, for in the blink of an eye on the electron planet, she and Hale had children, grew to old age and death, and were succeeded by countless generations.

This doesn't seem right to me. Time dilation would work in the opposite direction. It would have been Shirley and Hale that would have had an hour pass on an electron moving at the speed of light, while thousands of years came and went on Earth. Since the scientist's machine would not have survived, they would have been stranded on the electron planet.

The story is, however, one step up from the standard action-adventures in this sub-genre. Starzl had done some thinking about how relativity might affect the explorers of atomic universes.

Lloyd Arthur Eshbach came up with an interesting variation on the theme of subatomic worlds in his story "The Voice From The Ether" (1931 May, AMAZING). The protagonist intercepts a radio message from Mars, sent by a Martian mad scientist to warn the rest of the universe. After some difficulty, it was translated and forms the bulk of the story. Tuol Oro, to give him his name, was interested in subatomic microscopy, and as per standard plot, looks down through his superscience microscope to see an atom as a planet and satellites.

At that point, the story takes an interesting turn. Instead of shrinking Martians down to the atom, Tuol Oro enlarges the atom up to his scale. The proton he chooses turns out to be covered with a form of fast-growing slime mould. He quarantines it in a containment room.

As a card-carrying mad scientist, he wants revenge on all the other Martians who laughed at him, so he releases the fungi out onto the planet. Mars is quickly covered and its civilization is destroyed. Then Oro's laboratory is breached, and his radio message is cut off in mid-scream as the fungi swarm him.

"Beyond Infinity" is a 1950 episode of the old-time radio show DIMENSION X, written by Villiers Gerson. (This and hundreds of other OTR shows are available as free mp3s at www.archive.org) It is said to be an original script, but Gerson seems to have borrowed most of the story from the 1930s pulps.

This episode begins with an American reporter visiting a Slavic totalitarian country and making contact with revolutionaries. They are working on a machine that can shrink objects to microscopic size.

Nevermind all the other ramifications, the revolutionaries are only interested in using it to smuggle in armaments and tanks. One immediately wonders what happens to the mass of the objects. Shrinking a tank down to pinhead size is all very well, but could you pick it up and slip it into your pocket?

Notwithstanding that, the more immediate concern is the secret police, who raid the laboratory. The revolutionaries escape by being shrunk down so they can't be found. The interference by the police causes the machine to run amok and

shrink them to sub-atomic size. The revolutionaries step out onto an electron planet, and there they will stay.

The secret police have an informer in the laboratory who reverses the machine. It takes ten seconds, but they find that ten million years have passed on the electron planet. The revolutionaries had their descendants leave a message, something about peace and harmony and all that. Since the secret police can't find the atom they are on, and since the revolutionaries are long dead, it becomes a moot point. The story ends there, having no place else to go.

Shrinking Humans.

Not quite as extreme is shrinking humans down by other means but not to subatomic size. “Dr Grimshaw’s Sanitarium” was a short story by Fletcher Pratt which originally appeared in the 1934 May issue of AMAZING. I haven’t read it but I have an mp3 of a version done in 1950 for DIMENSION X. The OTR references can’t make up their mind whether Grimshaw ran a sanitarium or a sanatorium, and there is no consistency between the printed and audio versions.

A private detective investigates a suspicious dis-internment of a man supposedly dead but whose coffin was filled with sand. He infiltrates Grimshaw’s sanitarium. Patients are going missing. Soon he joins their ranks, for Grimshaw and his colleagues are ex-Nazis. After fleeing defeated Germany, they have resumed their experiments in endocrinology and how to shrink humans. The audio version obviously updated the story a bit.

The detective and another patient are shrunk down to doll-size. They plot to escape by short-circuiting an alarm system, but that starts a fire. Everyone dies. End of story, as the plot simply hits a brick wall and stops.

Someone at the radio network seems to have had a liking for miniaturization stories. “The Professor Was A Thief” was another 1950 episode of DIMENSION X, based on a story by L. Ron Hubbard. The story is told from the viewpoint of a newspaper editor as major buildings in Manhattan disappear one by one. Grant’s Tomb is first to vanish, then the Empire State Building, and so forth. A meek little scientist named Pertwee claims responsibility, but people are still refusing to believe their eyes, much less him.

Pertwee carries around a suitcase filled with what he claims are models of the missing buildings. Two reporters make the connection and chase him. They

catch him and his device. When threatened by his own ray gun, he blabs all. No one took him seriously so he decided on a dramatic demonstration.

His device uses “infinite acceleration” to compress objects into a fraction of their size via the Lorentz-FitzGerald contraction. Time stops at total contraction relative to the outside observers, so the people inside the buildings don’t know what happened. What happened to the mass of the buildings is completely avoided, and for good reason, since the mass should have gone to near-infinity and possibly created black holes.

The reporters get Pertwee to agree to reverse the miniaturizations in exchange for a front-page story telling all. Pertwee wants credit for his invention, instead of being ignored as a madman. The deed is done and the paper scores a scoop. Nothing is said of what the police and the Feds thought when they read the newspaper’s scoop. A mildly amusing story with lots of bluster.

“Pigmy Island” by Edmond Hamilton (1930 August, WEIRD TALES) is a mad scientist on an isolated island story. He has been researching pituitary glands and how they control growth. In the process, he develops two chemical solutions. The green solution shrinks mammals down to small size by causing them to use up tissue by excessive metabolism while maintaining the relative ratios of the organs and body.

That much can be considered plausible for suspension of disbelief because it explains how surplus mass could be safely discarded during the shrinking process. The red solution reverses the process by using inhaled air to add carbon, hydrogen, and oxygen to tissues and build them back up. The fallacy is that the body also needs other elements, some of which might be in airborne dust but not enough to succeed.

It’s the old Hulk problem; where does the big green guy get his extra mass? Be that as it may, the story is the conventional plot of good guys captured, drugged, shrunk down to a foot high, caged, escaped, and all that. They find the red solution, then kill the mad scientist, destroy the island, and make their way back to civilization.

What I like about this story is that the author went to some trouble to think up a plausible rationalization for the shrinking, instead of just hand-waving about radiation or some miracle.

Radiating Miracles Of Miniaturization.

DR CYCLOPS is a 1940 movie based on a story by Henry Kuttner. It preceded the better-known THE INCREDIBLE SHRINKING MAN by nearly two decades. Further, it was in Technicolor, not black-and-white in the style of B-movies like TISM. The mad scientist is actually named Dr Thorkel, but he does wear thick glasses and is near-blind without them.

His laboratory is in the Amazon jungle near a radium mine, which he needs for his experiments. The head office back home are worried about what he may be up to, so they send three scientists to check up on him. Along the way they hire a mule skinner to get them to their destination. Arriving at Thorkel’s laboratory, they get the runaround from him.

Eventually there is a confrontation which Thorkel wins by miniaturizing them down to about 15 cm high. The miniaturization SFX are well done, as are the giant props the actors clamber over. Their clothes didn’t shrink, so Thorkel gave them pocket handkerchiefs to cover themselves.

The shrunken heros, and one heroine, eventually manage to escape Thorkel’s laboratory but when they reach the yard they find they have jumped from the frying pan into the fire. The first hazard is a house cat that stalks them, from which they take refuge by hiding inside a clump of *Opuntia ficus-indica*. Many other adventures follow. Thorkel has size but the little folk can go places he can’t. He is one man, and has to sleep sooner or later, whereas they can stand shifts on watch.

A bloody battle takes place with Thorkel. They get an advantage over him by smashing all but one lens of his glasses and spares. From there, they set up an ambush over a deep well that Thorkel used to store his radium, into which he falls to his death. The miniaturization turns out to be temporary, and the little people slowly grow back to full size. Months later, having grown back to normal size, the heros and heroine return to civilization with a story to tell.

THE INCREDIBLE SHRINKING MAN is a 1957 movie based on a novel by Richard Matheson. The hero is exposed to a mixture of pesticides and radiation which somehow starts him shrinking at the rate of one-seventh of an inch per day. As he dwindles down, he has his share of adventures, including the house cat and a spider. There is no resolution in the movie; he keeps shrinking and it seems he will go down into the subatomic world.

The movie takes place in suburbia, and focuses on how people react to the poor fellow. As his size diminishes, he gets less and less respect from neighbours and friends and finally his wife. The final moments of the film see him shrunken down to a centimetre in height, trapped in the basement where there are no humans. He becomes completely disconnected from society, and, it seems, eventually from the universe.

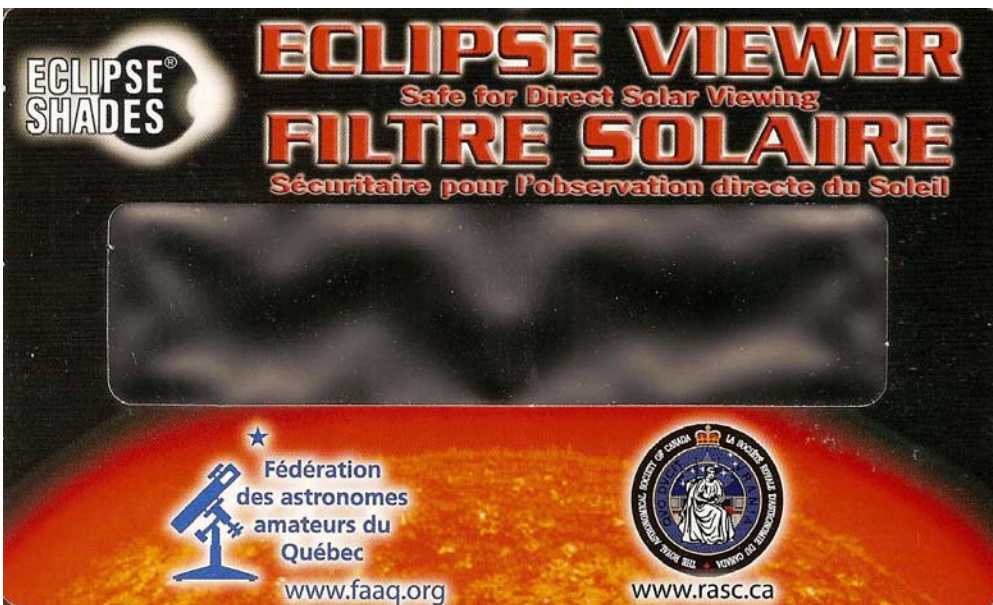
Of the two movies, DC has better production values, while the theme of TISM overrides its drive-in movie standards with its thoughtful look at prejudice and the uncertainty of the unknown.

PARTIAL SOLAR ECLIPSE AT CALGARY 2017-08-21
photos by Dale Speirs

Today was the big day, a solar eclipse cutting a swath from Oregon to North Carolina, across a heavily populated area of about 12.5 million people, and probably the same again who traveled to see it. In Calgary, the eclipse was 81%, according to the Royal Astronomical Society of Canada. It lasted from 10h20 to 12h50 Mountain Daylight Time, and the maximum was at 11h30.

Calgary has had a dry summer and the weather forecast for the eclipse was sunny, but we’ve been plagued for a month by forest fire smoke drifting in from British Columbia. The mountain skyline has been smoked out every day since the Stampede rodeo ended. Fortunately the smoke stayed low and the sun was high up in the sky.

The last partial solar eclipse I saw in Calgary was the event of 2014-10-23. I wrote that up in OPUNTIA #288. I used a pinhole camera which was nothing more than an index card with a hole poked in it. Very successful, and I repeated it again this time, using six pinholes on the card. I picked up a professionally made solar eclipse viewer at the freebie table during the When Words Collide 2017 convention (scan on next page), and used it as well.

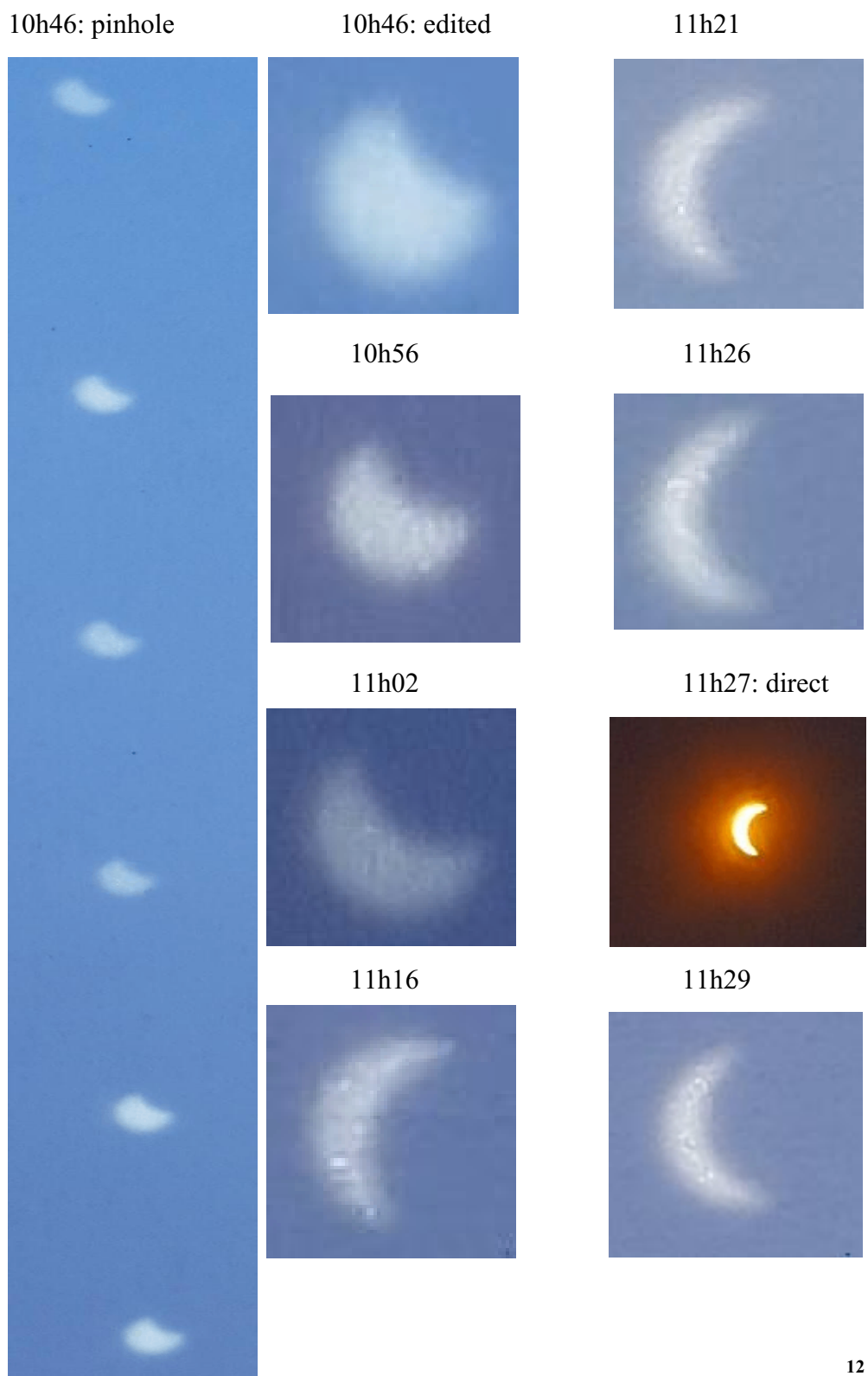


A miss is as good as a mile. At 81% maximum totality in Calgary, the Sun only dimmed slightly. The quality of its light did change noticeably, at least for those of us who were watching it. The majority of Calgarians went about their business and noticed nothing. There was no twilight.

I watched the eclipse from my driveway, alternating between photographing the image that was displayed by the pinhole camera, viewing it through my eclipse filter, and trying to photograph it directly through the filter. As a few pedestrians walked by, I let them look through the filter. They were suitably amazed. At 81%, half-moon figures appeared in the shadows of deciduous trees on the boulevard.

The pinhole camera images were inverted; I flipped them over on the computer to show the eclipse as I saw it through the filter. Unfortunately all but one of the camera shots through the filter failed. The camera was too sensitive and the sunlight flared, making it look round instead of eclipsed. The only successful shot was at maximum.

Herewith follow a selection of shots, with the time indicated. I show the first pinhole camera shot as the unedited strip of six images. The advantage of six pinholes was that at least one would be in focus. All the other shots are rotated and cropped to show how I actually saw the eclipse, except the colours, which through the filter were yellow on black.



A view of the shadows cast by the boulevard trees on the street at maximum.



SEEN IN THE LITERATURE

Dabrowski, M.P. (2017-08-13) **Singularities and cyclic universes.** arXiv:1708.03929v1 [gr-qc] Preprint at www.arXiv.org

Author’s abstract: *Cosmology is facing the problem of singularities, places where general relativity fails and one asks if one is able to avoid them under some generic conditions. The best definition of singularities is by geodesic incompleteness which allows to practically detect them without adopting them into the theory.*

It is interesting that because of the same evolution, one can consider that the universe 1 may replace its evolution along the trajectory of the universe 2 at the maximum expansion point by quantum effects. It is a new option for the evolution of the universe, now put in the context of the multiverse, where some effects take place at the turning point.

One is able to consider parallel evolving universes as a pair of spontaneously created from the vacuum state remaining quantum mechanically entangled during their classical evolution. An interesting effect is that for such a pair the entropy of entanglement is also large at the maximum point of expansion presumably signalling strong quantum effects there. This happens apart from large entropy and temperature of entanglements at the points of classical singularities.

Using these theories it is possible to create various cyclic universe scenarios and extend them into the cyclic multiverse scenarios with different evolution of the coupling constants and same geometries obeying the total 2nd law of thermodynamics.

These universes are classically disconnected, but they can be quantum mechanically entangled and the effect of entanglement can be detected in individual universes as the temperature or the entropy of entanglement perhaps signalling at the cosmic microwave background or the large-scale structure of the universe.

Speirs: Singularities are great fun because there are no facts to get in the way of a beautiful hypothesis. This paper suggests to science fiction writers a rationale for multiverses; just do a bit of handwaving about quantum entanglement between two universes.

Zhang, B., and K. Li (2017-08-09) **Relativistic astronomy.** arXiv:1708.03002v1 [astro-ph.HE] Preprint at www.arXiv.org

Authors' abstract: *The first prototype Sprites of 3.5 cm x 3.5 cm chips weighing just 4 grams each, which are the precursors to eventual StarChip probes, have been recently launched to a low-earth orbit. Here we point out that due to the relativistic effects, trans-relativistic cameras serve as natural lenses and spectrographs while traveling in space, allowing humankind to study the astrophysical objects in a unique manner and to conduct precise tests on special relativity. Launching trans-relativistic cameras would mark the beginning of relativistic astronomy.*

When a camera travels in space with a speed close to c , in the co-moving frame of the probe, all astronomical objects undergo unique Doppler boost (Doppler factor $D > 1$) or de-boost ($D < 1$) depending on the Lorentz factor of the probe and the angular separation between the object with respect to the direction of probe motion. For the problem involving a flying probe, one can define two rest frames: the Earth rest frame or the laboratory frame (which is also the rest frame of astronomical objects), K , and the probe co-moving frame, $K0$.

Speirs: The proposal to send tiny laser-boosted space probes to the stars at partially relativistic speeds means that the photos will show the starbow effect. Star fields ahead of the microprobe will appear more compressed than as we see them from Earth.

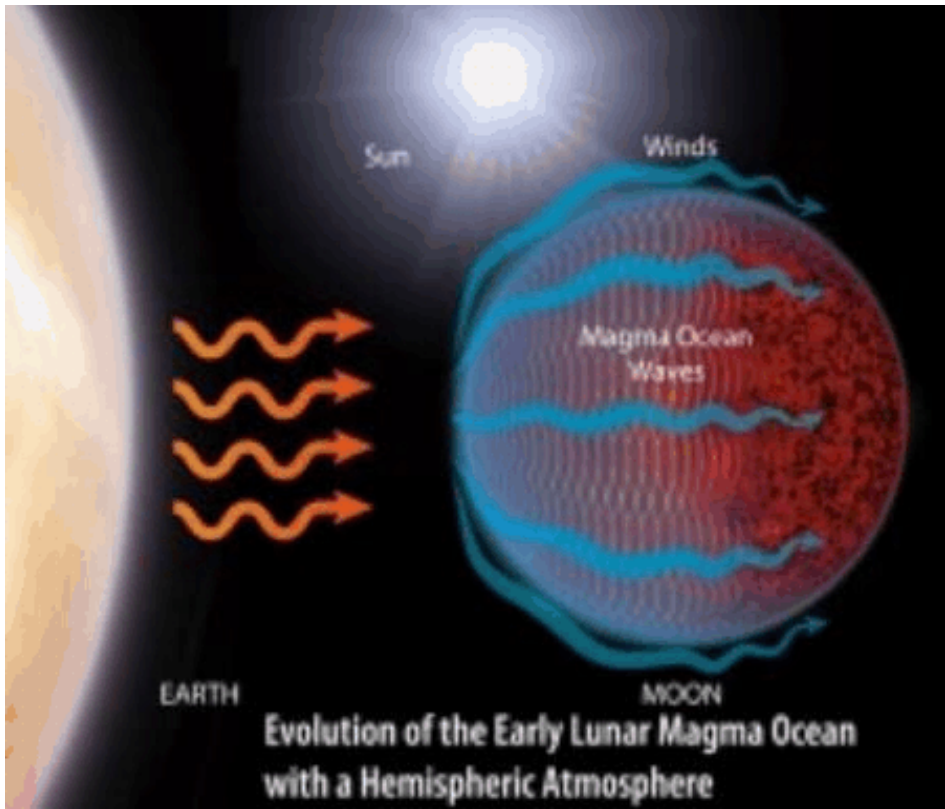
Saxena, P., et al (2017) **A model of the primordial lunar atmosphere.** EARTH AND PLANETARY SCIENCE LETTERS 474:198-205

Authors' abstract: *We create the first quantitative model for the early lunar atmosphere, coupled with a magma ocean crystallization model. Immediately after formation, the moon's surface was subject to a radiative environment that included contributions from the early Sun, a post-impact Earth that radiated like a mid-type M dwarf star, and a cooling global magma ocean. This radiative environment resulted in a largely Earth-side atmosphere on the Moon, ranging from $\sim 10^4$ to $\sim 10^2$ pascals, composed of heavy volatiles (Na and SiO).*

This atmosphere persisted through lid formation and was additionally characterized by supersonic winds that transported significant quantities of moderate volatiles and likely generated magma ocean waves. The existence of

this atmosphere may have influenced the distribution of some moderate volatiles and created temperature asymmetries which influenced ocean flow and cooling. Such asymmetries may characterize young, tidally locked rocky bodies with global magma oceans and subject to intense irradiation.

[image is from this paper]



Lingam, M., and A. Loeb (2017-08-14) **Risks for life on habitable planets from superflares of their host stars.** arXiv:1708.04241v1 [astro-ph.EP] Preprint at www.arXiv.org

Authors' abstract: *We propose that the most powerful superflares can serve as putative drivers of extinction events, and that their periodicity corresponds to certain patterns in the terrestrial fossil extinction record. On the other hand, weaker superflares may play a positive role in enabling the origin of life through the formation of key organic compounds. Superflares could also prove*

to be quite detrimental to the evolution of complex life on present-day Mars and exoplanets in the habitable zone of M- and K-dwarfs. We conclude that the risk posed by superflares has not been sufficiently appreciated, and that humanity might witness a superflare event in the next 103 years leading to devastating economic and technological losses.

Flares are eruptions of high-energy radiation from stars, and phenomena associated with these events have been recorded, and studied, throughout human history. One of the powerful solar flares on record, the Carrington event, dates back to more than 150 years ago.

However, the launch of the Kepler mission to detect exoplanets greatly altered, and advanced, our understanding of the statistics of flares. The analysis of the Kepler data revealed that highly energetic flares, dubbed superflares, occurred on M-, K- and G-type stars with a fairly high frequency. In turn, this discovery reignited interest in the possibility that superflares could occur on the Sun over the span of a few thousands of years. In parallel, based on evidence from radionuclides in tree rings, Miyake et al suggested that a solar superflare could have arisen over a millennium ago.

Barnes, Rory (2017-08-09) Tidal locking of habitable exoplanets.
arXiv:1708.02981v1 [astro-ph.EP] Preprint at www.arXiv.org

Author's abstract: Potentially habitable planets can orbit close enough to their host star that the differential gravity across their diameters can produce an elongated shape. Frictional forces inside the planet prevent the bulges from aligning perfectly with the host star and result in torques that alter the planet's rotational angular momentum. Eventually the tidal torques fix the rotation rate at a specific frequency, a process called tidal locking.

Tidally locked planets on circular orbits will rotate synchronously, but those on eccentric orbits will either librate or rotate super-synchronously. Although these features of tidal theory are well-known, a systematic survey of the rotational evolution of potentially habitable exoplanets using classic equilibrium tide theories has not been undertaken.

I calculate how habitable planets evolve under two commonly-used models and find, for example, that one model predicts that the Earth's rotation rate would have synchronized after 4.5 Gigayears if its initial rotation period was 3 days,

it had no satellites, and it always maintained the modern Earth's tidal properties. Lower mass stellar hosts will induce stronger tidal effects on potentially habitable planets, and tidal locking is possible for most planets in the habitable zones of GKM dwarf stars. For fast rotating planets, both models predict eccentricity growth and that circularization can only occur once the rotational frequency is similar to the orbital frequency.

The orbits of potentially habitable planets of very late M dwarfs ($< 0.1 M_{\odot}$) are very likely to be circularized within 1 Gyr and hence those planets will be synchronous rotators. Proxima b is almost assuredly tidally locked, but its orbit may not have circularized yet, so the planet could be rotating super-synchronously today.

The evolution of the isolated and potentially habitable Kepler planet candidates is computed and about half could be tidally locked. Finally, projected TESS [Transiting Exoplanet Survey Satellite] planets are simulated over a wide range of assumptions, and the vast majority of all cases are found to tidally lock within 1 Gyr. These results suggest that the process of tidal locking is a major factor in the evolution of most of the potentially habitable exoplanets to be discovered in the near future.

Ou, Q., et al (2017) Three Cambrian fossils assembled into an extinct body plan of cnidarian affinity. PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES USA 114:8835-8840

Authors' abstract: The early Cambrian [520 megayears ago] problematica Xiangyanguangia sinica, Chengjiangopenna wangii, and Galeaplumosus abilis from the Chengjiang biota (Yunnan, China) have caused much controversy in the past and their phylogenetic placements remain unresolved. Here we show, based on exceptionally preserved material (85 new specimens plus type material), that specimens previously assigned to these three species are in fact parts of the same organism and propose that C. wangii and G. abilis are junior synonyms of X. sinica.

Our reconstruction of the complete animal reveals an extinct body plan that combines the characteristics of the three described species and is distinct from all known fossil and living taxa. This animal resembled a cnidarian polyp in overall morphology and having a gastric cavity partitioned by septum-like structures. However, it possessed an additional body cavity within its holdfast,

an anchoring pit on the basal disk, and feather-like tentacles with densely ciliated pinnules arranged in an alternating pattern, indicating that it was a suspension feeder rather than a predatory actiniarian.

*Phylogenetic analyses using Bayesian inference and maximum parsimony suggest that *X. sinica* is a stemgroup cnidarian. This relationship implies that the last common ancestor of *X. sinica* and crown cnidarians was probably a benthic, polypoid animal with a partitioned gastric cavity and a single mouth/anus opening. This extinct body plan suggests that feeding strategies of stem cnidarians may have been drastically different from that of their crown relatives, which are almost exclusively predators, and reveals that the morphological disparity of total group Cnidaria is greater than previously assumed.*

[image is from this paper]



Topstad, D., and J.A. Dickinson (2017) **Thyroid cancer incidence in Canada: a national cancer registry analysis.** CANADIAN MEDICAL ASSOCIATION JOURNAL doi:10.9778/cmajo.20160162

Authors abstract: *Thyroid cancer incidence rates are increasing in many developed countries while mortality rates remain stable. International evidence shows that the increase in incidence rates is mostly caused by overdiagnosis of small papillary cancers. We sought to describe how thyroid cancer incidence has changed and how it varies between provinces in Canada.*

Data were obtained from the National Cancer Incidence Reporting System, causes of death tables and the Canadian Cancer Registry using the 1991 census population structure. We report thyroid cancer incidence by sex, age and province and mortality by sex from 1970 to 2012.

Since 1970, age-standardized thyroid cancer incidence rates have increased in women from 3.9 to 23.4 per 100 000 and in men from 1.5 to 7.2 per 100 000 while mortality rates have remained stable at around 0.5 per 100 000 for both sexes. In 2012, incidence rates for both women and men were highest in Ontario (31.5 and 9.2 per 100 000, respectively) and lowest in British Columbia (13.2 and 4.5 per 100 000, respectively). Age-specific incidence rates were the highest in Ontarian women aged 50–54 years, at 65.2 per 100 000.

The rapid increase in thyroid cancer incidence especially since 1990, the variation among provinces and the peak in middle-aged women does not correspond to any known cause or risk factor for disease, although the lack of change in mortality rates suggests that serious thyroid cancer has not increased. The likely cause of the increase in incidence is an overdiagnosis epidemic for clinically unimportant lesions detected by modern diagnostic imaging. To reduce the harms of overtreatment, overdiagnosis should be reduced, through more judicious use of diagnostic imaging.

Speirs: When in university, I took a biostatistics course. The professor who taught it once remarked that medical statistics should be taken with several kilos of salt. Incidentally, there was notice of a recent study at Boston University which showed that salt doesn't cause high blood pressure after all.

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: Cliff Samuels 2017-08-14
Calgary, Alberta

Re: OPUNTIA #387: Thank you for your in-depth review of WWC. I got a kick seeing my license plate in your zine. I’ve had SKIFFIE for decades. Eileen got it for me as a birthday present before we when to MosCon where I was guest of honor that year. I view my car like Doctor Who. The body keeps changing but the name remains the same. This is the fourth /b/o/d/y/ vehicle.

FROM: Lloyd Penney 2017-08-17
Etobicoke, Ontario

OPUNTIA #384: I doubt I will ever get to a Stampede, so pictures of the event will help me live it vicariously. However, I suspect there’s too many people there for my liking. Tomorrow, the Canadian National Exhibition opens here, and Yvonne and I have avoided going to that for nearly 30 years. Too big, too crowded, too expensive, and not much to appeal to our current interests.

I have never seen that Oh Canada! Version of the Oh Henry! Bar. I really don’t look for anything like that these days, but it does bother me that almost all visible celebrations of Canada 150 around here consists of some kind of consumer good. I guess it’s all made me a little pessimistic; it will all be done soon, too.

[I don’t see the problem with commercial products helping to publicize things. God help us if everything was only done by Ottawa bureaucrats.]

OPUNTIA #385: Re: Moraine Lake. More great pictures. It’s all a great place for wedding pictures, as we can see. Indeed, good exercise to get up and around it to take it all in.

[I do indeed use my mountain hikes and Calgary walks as an excuse to get out and exercise. It makes them a little more interesting if I am looking around for

photo opportunities for this zine. Since OPUNTIA began in March 1991, I’ve always viewed events around me as copy for the zine, whereas many of them might otherwise have irritated me.]

OPUNTIA #386: I’ve read extensively about the installation of the trans-Canadian railway, so I have at least a little idea of how difficult it must be to put through highways around the Rockies.

[Pity the truck and bus drivers who have to go through in winter. There are large signs at the continental divides telling drivers that tire chains must be used when the warning light is flashing, which is whenever a blizzard is coming. The Trans-Canada Highway is blocked several times every winter by avalanches, delaying traffic by days, not hours.]

My previous letter: I understand that glaciers have been melting away for thousands of years, but human activity has accelerated the process. My comments on Rotsler’s Rules of Masquerades come from the fact that this year’s CostumeCon took place earlier in the year in neighbouring Mississauga.

OPUNTIA #387: I really do like the stone stairs and gazebos I find in some parks. It makes it look like there’s a destination just around the next tree. There are gazebos everywhere here, too. I remember one in the park down the street when I was 5, but it may have been a bandstand.

Re: WWC report about Sherlock panel. I have many of Charles Prepolec’s Sherlockian collections on my book shelves, and I think I may be missing one or two. I shouldn’t be talking of getting more books, for the weeding of the books we do have continues.

[I still buy books but I have a strict rule that when one enters the house, another goes out to the Little Free Library. I’ve thinned out about half my library in the past five years.]

AROUND COWTOWN

photo by Dale Speirs

2017-08-06

As I strolled out one afternoon on a sunny day when the forest fire smoke was minimal, I saw this long string of rafters on the Bow River. The photo was taken from the 14 Street West bridge, looking east downstream to the downtown core.

I took this photo for a different reason. Watching the rafters, I noticed a dust devil come off the riverbank at right and move left directly overtop the middle batch of rafters. I've seen countless dust devils on land, but this was the first time I ever saw one on water.

It moved so fast that by the time I got my smartphone out of my shirt pocket and the camera fired up, its spout had faded from view. However, the eddy was still there. At centre left, just left of the middle group of rafters, you can see a circular ripple in the water and its wake trailing downstream. That was the water devil.

