OPUNTIA

286

Middle October 2014

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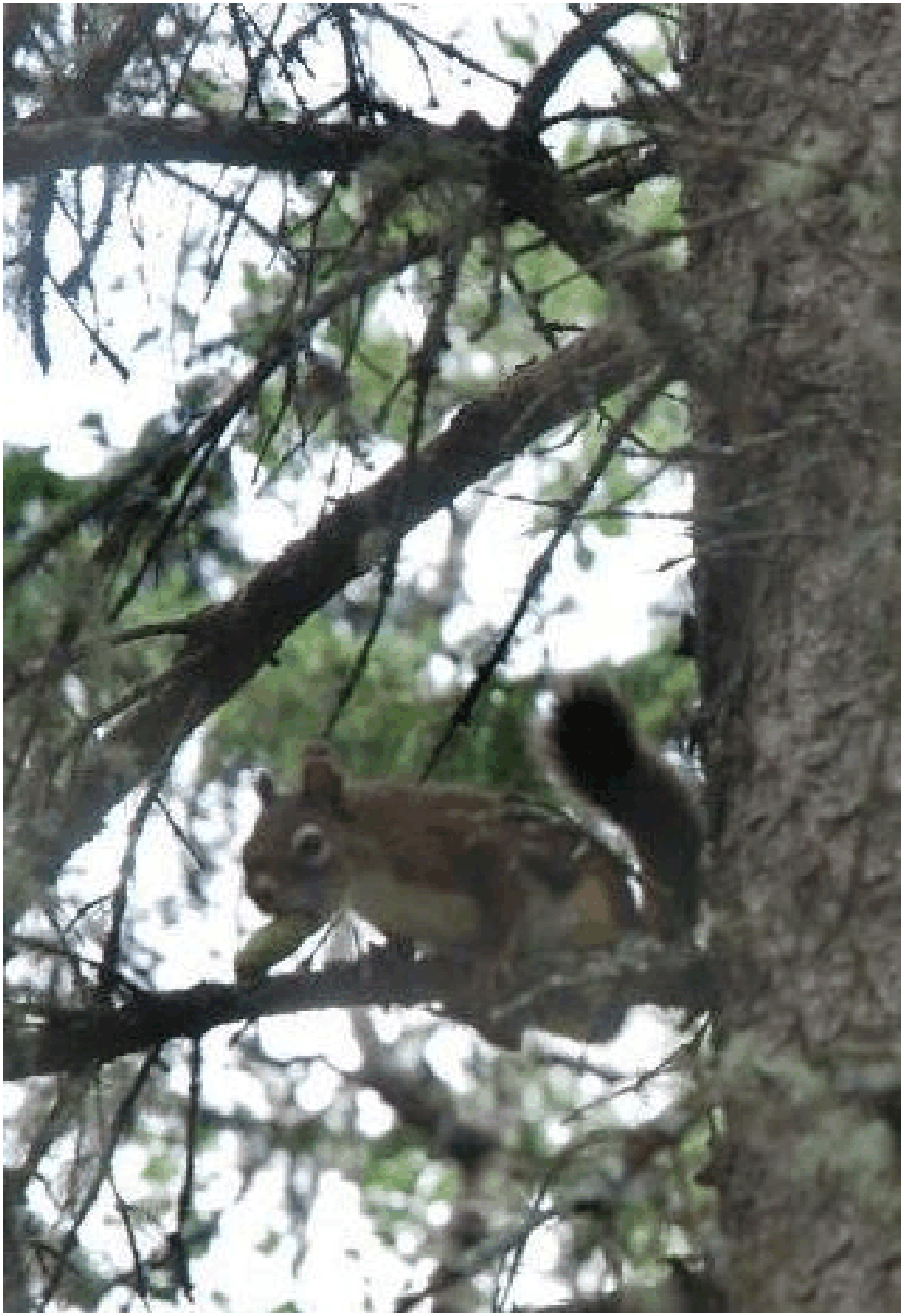
ROCKY FOOTHILLS WAY
photo by Dale Speirs

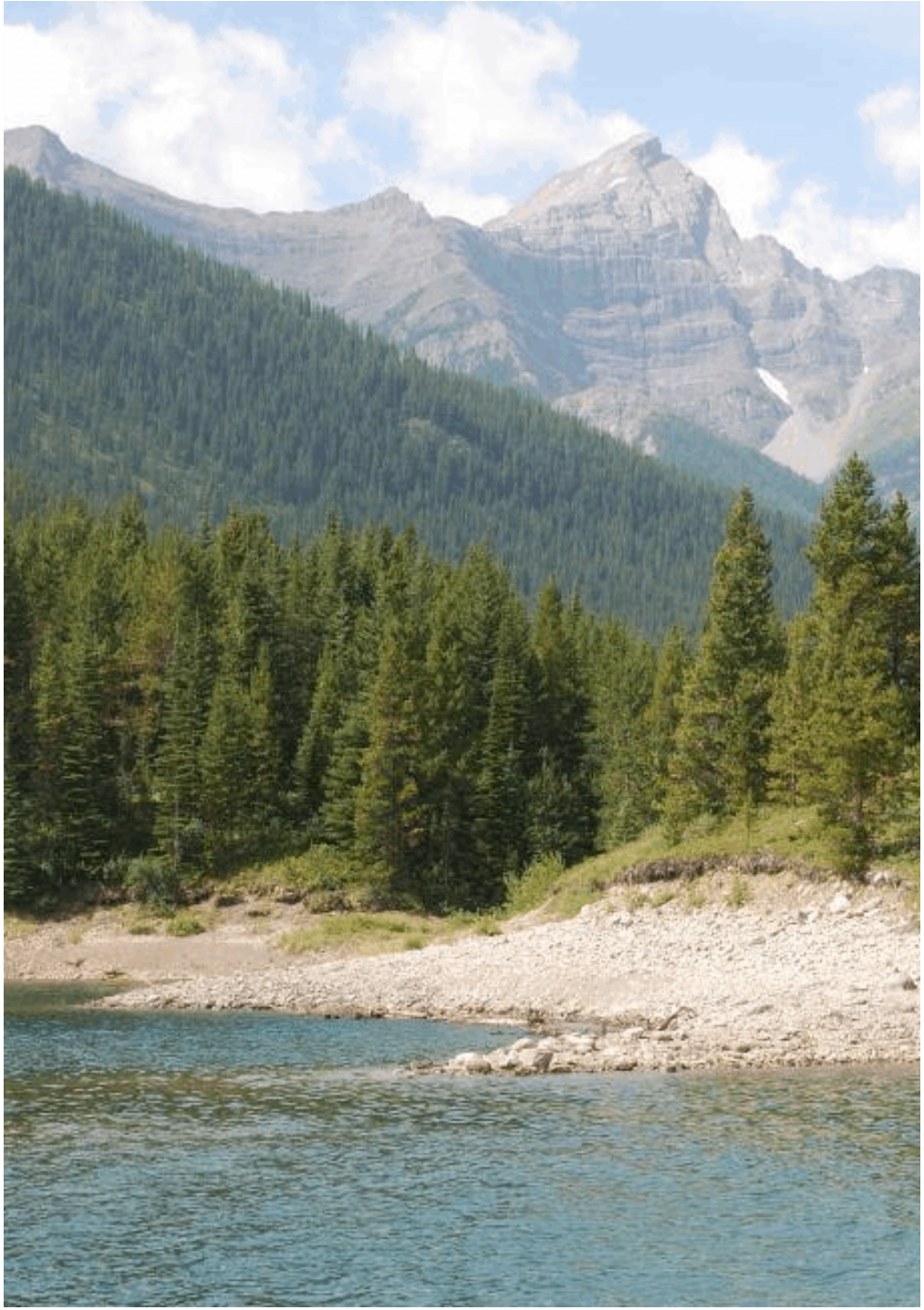
I saw this squirrel while hiking in Brown-Lowery Provincial Park, in the foothills just southwest of Calgary. Despite the fact that it had its mouth full with a spruce cone, it was chattering at me at top volume. The photo is a bit fuzzy because I was using the telephoto at maximum range since it was high up in the tree.



ROCKY MOUNTAIN WAY: LOWER KANANASKIS LAKE
by Dale Speirs

2014 was a good summer for hiking near Calgary. The panorama below is looking northeast across Lower Kananaskis Lake in the morning sun.

Below is looking west from the far end of the lake.



Kent Creek Falls, at the north end of the lake, were difficult to photograph because of all the shrub willows hanging over the water.

Looking south from the north end of the lake. The water sparkled beautifully in a way that could only be done justice with a video camera.

THE SCIENCE OF COUNTERFACTUALS
by Dale Speirs

There is a scientific basis for the idea of alternative histories, not just a matter of them being idle intellectual exercises.

Quantum Mechanics.

Perhaps more than any other theory save Darwinian natural selection, quantum mechanics has upset people. This is not from a consideration of first principles or for technical reasons, but from the gut reaction, as Albert Einstein put it, that God does not play dice with the universe.

Erwin Schrodinger's famous paradox of a cat inside a box, possibly dead or not from an automatic randomly triggered device to kill it, represents a logical extension of quantum mechanics that offends common sense but satisfies mathematical formulae. The paradox of Schrodinger's cat supposes a mechanism inside the box with a single radioactive atom, and a Geiger counter connected to a hammer held over a bottle of acid. If the atom suddenly decays and emits an alpha particle, the Geiger counter detects it and releases the hammer. It in turn smashes the bottle of acid and the fumes kill the unfortunate feline [3]. We don't know if the cat is dead or alive until we open the box, therefore Schrodinger says it is neither.

Schrodinger said that if the box is impenetrable to the observer, then the only way to see if the cat is dead or alive after a certain time period is to open the box. As long as the box is closed the cat is in two states at the same time. An event does not exist until someone observes it. The cat is both dead and alive until someone observes it. When the box is opened the transitional states collapse into one of the two outcomes. The cat is either dead or alive, but no longer both. The act of observation has flipped the cat into one of the two states.

As an interesting aside, someone who knew Schrodinger and visited him in his home said he did not own a cat, although he did have a grandaunt who had six Angora cats [2, 4].

Parallel Universes.

The next step out in the physics of alternative histories is to consider the idea of Hugh Everett III. Niels Bohr produced the Copenhagen Interpretation of quantum mechanics in the 1920s, which was used to explain Schrodinger's cat by saying there were two wave functions which collapsed into one wave at the moment of observation. Everett produced the Many Worlds Interpretation, which says that all possibilities exist because the wave functions do not collapse but split into different universes.

Hugh Everett III published in July 1957 his doctoral thesis, which was important enough to be immediately followed by an editorial praising it, pretty heady stuff for a newly-minted PhD [1]. This paper is one of the basic foundations of alternative history. It reminded me of Watson and Crick's famous paper announcing the discovery of the structure of DNA. At first glance they merely published the dull recitation of an obscure biochemical reaction. At the end is a modest tagline that the authors are not unaware of the possibilities of the DNA structure. In like manner, this paper appears to be mathematical speculation on quantum theory, but there is one footnote which allows the scientific possibility of parallel universes.

The main text of the paper takes issue with the habit of physicists postulating various thought experiments where observers watch a series of events from which a conclusion is to be made. Everett considers that quantum theory cannot be considered as observable from outside a system. All observations must take place inside the system being observed. There is only one physical system with the observer, but more than one 'state' of observer. Each observation branches

the observer into numerous states. The observer moves into as many different parallel universes as there are possible outcomes, and each observer considers that he is in the only real universe.

Say, for example, the observer is watching an electron which could do any one of 16 different things at any split second. Each split second, the universe branches into 16 para-universes, with 16 observers each having seen a different action of that electron. Each branch would also branch in the next micro-unit of time. There would quickly build up an infinite or at least extremely large number of universes, one for each point of divergence.

This is not immediately obvious from Everett's main text, but a footnote he writes makes it clearer: " *... all branches are actual, none any more real than the rest. It is unnecessary to suppose that all but one are somehow destroyed, since all the separate elements of a superposition individually obey the wave equation with complete indifference to the presence or absence ("actuality" or not) of any other elements. This total lack of effect of one branch on another also implies that no observer will ever be aware of any splitting process. Arguments that the world picture presented by this theory is contradicted by experience, because we are unaware of any branching process, are like the criticism of the Copernican theory that the mobility of the Earth as a real physical fact is incompatible with the common sense interpretation of nature because we feel no such motion.*".

The paradox of Schrodinger's cat would combine with Everett's thesis to produce two universes the moment the box is opened. The states do not collapse, they split. In one para-universe the cat lived; in the other it died.

Chaos Theory.

A much abused and mis-used theory, especially when literary critics and non-science graduate students get hold of it. The theory has many facets but for consideration of alternative histories one of the basic parts would be the mathematics of period doubling.

Suppose that one has a system defined by equations and which starts out behaving in a predictable manner. As the system is iterated, that is, each result of the equation fed back in as the next input, it will begin to oscillate and requires time to return to its original state. This amount of time is called, simply enough, the period. At certain values, the time to return to a stable condition suddenly doubles. After several period doublings, the system does not return and instead begins to vary randomly. It becomes chaotic no matter what, and anything can happen [5].

All very interesting, but like a newborn baby, what use is it? Alvin Saperstein considered the practical applications of this branch of chaos theory in regards to history [6]. He studied munitions expenditures during the arms race of the 1930s in Europe and calculated the period doubling. At the time World War Two broke out, these expenditures had reached the stage where the period doubling had jumped the system into the chaotic phase, where anything could happen to trigger massive system swings. In other words, war.

Another application was to the Earth's magnetic field, which at frequent intervals through geological history switches polarization and reverses its magnetism. Why it does so is a matter of conjecture. Most explanations relate to physical causes, but an application of chaos theory to the subject [7] suggests that the normal oscillations of the magnetic field would be expected to enter a chaotic state every so often. This has also been suggested for planetary orbits [15], which are inherently chaotic. The spin axis of a planet can change chaotically, thus altering seasons. In extreme cases, the planetary orbits can be changes, such as trading places in orbits or being ejected from a system entirely.

This provides a mathematical explanation for what alternative history writers know, namely that after you get several steps past the point of divergence, anything can happen. It seems to me that this might provide a reconciliation between the Tide of History theory and the Great Man theory, the former of which insists on unstoppable trends and the latter saying that history is random. I suggest the Tide operates during the normal period doubling. When the historical system doubles one last time and flips into the chaotic zone, the Great Man randomness takes over.

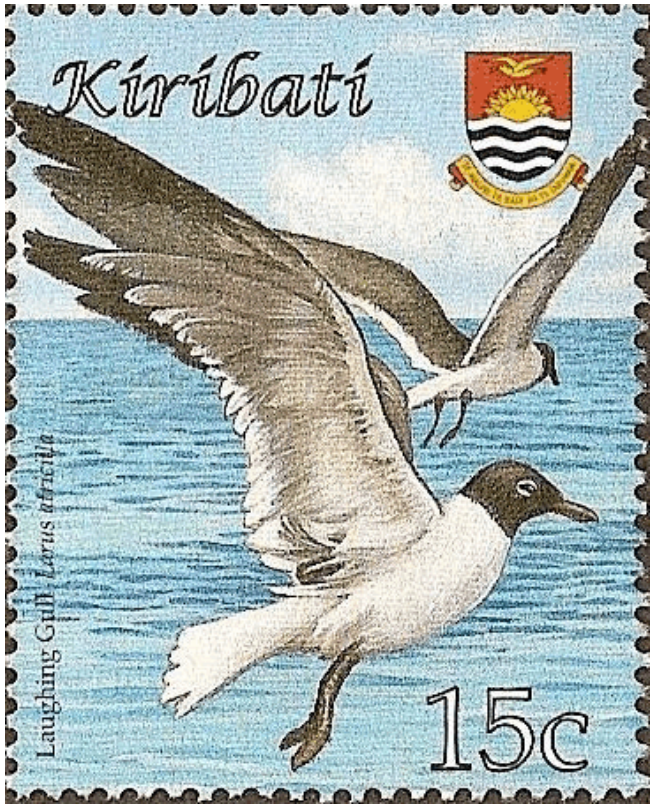
The Seagull Effect.

The most famous application of chaos theory to real life is the so-called Butterfly Effect, which suggests that a butterfly fluttering through an Amazon jungle will trigger a hurricane in the Atlantic a month later. This began in 1963 with a meteorologist named Edward Lorenz, who was running a computer programme to produce a long term weather forecast. He was using data inputs measured to six decimal points. One day he needed an extra copy of a printout and keyed in the data a second time, but only to three figures, being in a hurry

and figuring the results would only be marginally different. While the computer was printing the output (remember this was in 1963 before Apple and Microsoft) Lorenz stepped out for a cup of coffee. Coming back, he glanced at the output and was shocked to see the prediction was completely different than the first one.

What had happened was that the computer was rounding off the three decimal points slightly different than the six decimal points. The small difference at the beginning ballooned out into a radically large difference after a few iterations. This was not the computer's fault; it was a basic philosophical issue, one of the starting points, in fact, of modern chaos theory.

The incident destroyed Lorenz's faith in any ability of humans to make long-distance predictions. Lorenz published a ground-breaking paper in 1963 in which he summarized: " ... *nonperiodic solutions are ordinarily unstable with respect to small modifications, so that slightly differing initial states can evolve into considerably different states. ... The feasibility of very-long-range weather prediction is examined in the light of these results.*" [8].



This principle of chaos theory is now known as the Butterfly Effect, but interestingly enough Lorenz originally referred to it as the Seagull Effect.

The application of this effect to alternative history suggests that near-future (for the characters, not the author) stories can and should be reasonably extrapolated from the known facts.

The long-range extrapolation can go in any direction as long as the events are derived logically from the previous iteration. Combined with period doubling, one can confirm mathematically what speculative authors have always taken for granted, that the further ahead you go, the more room you have to play around.

There are, however, some limits in that: " ... *randomness is interleaved with order, that simplicity enfolds complexity, complexity harbours simplicity, and that order and chaos can be repeated at smaller and smaller scales* ... " [9]. In short, a chaotic system will be attracted to some sort of pattern or function.

Attractors.

In a chaotic field, there are still windows of order. There are attractors, which basically pull the system into a visible pattern. These patterns cannot be described by a traditional mathematical equation, but can be outlined by computer iterations. This is why they took so long to be discovered, as computers to calculate and plot the systems on a monitor have only been available in the last couple of decades at a reasonable cost. Those patterns produce the beautiful Mandelbrot and Julia sets, fractal patterns which have infinite detail but are still visibly patterned.

Despite the chaotic condition of a system, it will tend to stay around certain functions. An analogy is a rock that falls off a mountain top [9]. The rock will bounce about chaotically but will end up in the valley. If there is more than one valley, the rock may go to a different valley on a subsequent iteration, but still can only end up in a valley. It will not bounce back up to the mountain top, no matter how chaotic its path. Each time the rock is dropped off the mountain top, it will take a different course but it will always go down into the valley. The valleys are the attractors.

Here one considers again the Tide of History as an attractor. The route to it is chaotic, helped along at random by Great Men, but if the system runs long enough it will eventually fall into one valley out of a few. Hitler, for example, is the very epitome of the Great Man theory of random chaos, but the Tide of History ensured that Germany could never win against the whole world, and the Nazis fell into one particular valley.

The Distribution Of Events And Things.

Simon Newcomb is an astronomer of the 1800s best known for his unfortunate prediction that heavier-than-air flight would never be possible. However, he did better on other items, one of which grew out of his observation that books of logarithmic tables wore out unevenly under heavy use. He would have noticed this because they were a standard tool for astronomers. Certain pages were always heavily thumbed while other pages were seldom used. In an 1881 article [11] he wrote: "*That the ten digits do not occur with equal frequency must be evident to any one making much use of logarithmic tables, and noticing how much faster the first pages wear out than the last ones. The first significant figure is oftener 1 than any other digit, and the frequency diminishes up to 9.*".

Table 1: Probability of significant digits.
from Newcomb, 1881 (ref. 11).

Digit	First digit (%)	Second digit (%)
0	n.a.	11.97
1	30.10	11.39
2	17.61	10.88
3	12.49	10.43
4	9.69	10.03
5	7.92	9.67
6	6.69	9.34
7	5.80	9.04
8	5.12	8.76
9	4.58	8.50

This observation was re-discovered by Frank Benford, who, in 1938, noted that numbers that are individually without relationship (that is, not calculated from each other), and are not purely random or purely hierarchal, follow a distribution law when in large groups [12]. This was merely a restatement of Newcomb, but through no fault of Benford, it is now called Benford's Law. Whether statistical data from nature, or accounting spreadsheets [13], the first digit of such a database will be a 1 about 30% of the time, a 2 about 17% of the time, and so on as in Table 1.

This distribution law is used by accountants to detect fraud in financial statements, and scientists to test the naturalness or reasonableness of data. A spreadsheet with 20% of the numbers starting with a 6 is probably fraudulent, and a table measuring how many animals are in a hectare that has 40% of the numbers starting with an 8 may have data collection errors or sampling bias. What is interesting is that: " *... the hundredth significant-digit is also dependent on the first few significant digits, although the dependency decreases as distance between the digits increases.*" [14].

Suppose then, that we combine this with Lorenz's problem of predicting weather with butterflies. The number of digits he used in his predictions affected the result, but Benford's Law suggests that this will limit itself at some certain decimal point of significant digits. If you predict a history from a numerical database, there is not an infinite number of variations because of the butterfly effect, for the distribution law is basically another way of showing limits established by some attractor.

Are Humans Inevitable Or Random Chance?

A popular scenario of science fiction writers is the time traveller who makes a trivial change in the Mesozoic or earlier, such as stepping on an insect, which results in humans never having existed. But would this be so?

Simon Morris, who has written on the remarkable animals of the Burgess Shale of 520 megayears ago, considers that evolution is constrained by ecological pathways [10]. If whales had not evolved, then some other large ocean-going filter-feeding animal would have. The limited number of habitats forces evolution into a limited number of paths, which is why convergent evolution is so common. Habitats act as chaotic attractors. Evolution cannot run unrestrained in any random direction because natural selection will keep pulling it back. Giant squids cannot develop on the prairies, and parafelines never occurred at the bottom of the ocean. Random events such as asteroid strikes or continental drift may throw species into the dustbin of history, but other, similar kinds will eventually take over.

Erect bipedal animals with co-operative behaviour and enlarged brains could well have developed from dinosaurs had not mammals pre-empted them. When hominids began developing, *Homo sapiens sapiens* was one of many, but had there been a bad day in east Africa, some other hominid would have filled the empty niche.

References.

1] Everett, H. (1957) "Relative state" formulation of quantum mechanics. REVIEWS OF MODERN PHYSICS 29:454-462

2] Reynolds, M. (1998) Schrodinger's cake. NEW SCIENTIST 157(2125):60

3] Schrodinger, E. (1935) Die gegenwartige Situation in der Quantenmechanik. NATURWISSENSCHAFTEN 23:807-812,823-828,844-849. The English translation of this paper is available at: Trimmer, J.D. (1980) The present situation in quantum mechanics: A translation of Schrodinger's "cat paradox" paper. PROCEEDINGS OF THE AMERICAN PHILOSOPHICAL SOCIETY 124:323-338

4] Moore, W. (1989) Schrodinger: Life and thought. Published by Cambridge University Press, England. page 19

5] May, R.M. (1976) Simple mathematical models with very complicated dynamics. NATURE 261:459-467

6] Saperstein, A.M. (1984) Chaos - a model for the outbreak of war. NATURE 309:303-305

7] Robbins, K.A. (1976) A moment equation description of magnetic reversals in the Earth. PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE USA 73:4297-4301

8] Lorenz, E.N. (1963) Deterministic nonperiodic flow. JOURNAL OF THE ATMOSPHERIC SCIENCES 20:130-141

9] Briggs, J., and F.D. Peat (1989) Turbulent mirror. Published by Harper & Row, New York. Pages 36 to 43.

10] Morris, S.C. (1998) The crucible of creation. Oxford University Press, England. Chapter 8.

11] Newcomb, Simon (1881) Note on the frequency of use of the different digits in natural numbers. AMERICAN JOURNAL OF MATHEMATICS 4:39-40

12] Benford, Frank (1938) The law of anomalous numbers. PROCEEDINGS OF THE AMERICAN PHILOSOPHICAL SOCIETY 78:551-572

13] Nigrini, M. (1999) I've got your number. JOURNAL OF ACCOUNTANCY 187:79-83

14] Hill, Theodore P. (1995) The significant-digit phenomenon. AMERICAN MATHEMATICAL MONTHLY 102:322-327

15] Murray, N., and M. Holman (2001) The role of chaotic resonances in the Solar System. NATURE 410:773-779

COUNTERFACTUALS: INTERLINKING

by Dale Speirs

Alternative histories or counterfactuals are great fun because the true facts can be dismissed if they get in the way. I like to link them in a chain if I can.

Divergence 1241 in Mongolia: Ogodai Khan has a prophetic dream that inspires him to give up drinking. He doesn't die of acute alcoholism, and Batu's invading army in Europe is not pulled back to elect a new Khan.

What Happened In Our Timeline.

Alcohol was a strong part of a Mongol's life, for an unusually high percentage of Mongol nobility died young from over-imbibing [1]. Ogedei (I will use a more common spelling of his name) was the third son of Genghis (or Chingis) Khan. Ogedei was elected Great Khan in 1229 and died in 1241. He was not as hard-driven as his father, not that the victims of the Mongols knew the difference.

The Mongols continued attacks against China, Persia, and Europe [2]. The fabled Silk Roads of inner Eurasia, which date back to 4000 B.C. when pastoralism first emerged in the area, had their golden age when they were part of the Mongol Empire. They declined after 1250 A.D. with the long fadeout of the Mongols [6].

Batu, grandson of Genghis, led the Golden Horde into Europe. The swiftness and ferocity of the Mongol attacks horrified Christians but did not divert them from their incessant squabbling within Europe. The campaign began with attacks against the Bulgars and Kipchaks in 1237. The Horde raided into Russia in 1237/38, the only foreign invaders to successfully defeat the Russians in winter. Ukraine suffered the horse nomads in 1240, and Poland in 1241. The main European target was Hungary, which fell in April 1241. By February 1242, Batu and his troops were heading into Austria en route to Vienna.

On the way, he learned of Ogedei's death. As he wanted to be in at the choosing of a new Great Khan, he turned about and headed home, trashing the Danube route along the way [5]. The Mongols never returned, and Europe was saved by an unlikely point of divergence

What Happened In Another Timeline.

Dreams are the subconscious reprocessing of neural circuits by the brain, quite often bringing in the events or thoughts of the previous day. The brain basically runs defragging software through its memory circuits to re-pack the files more efficiently. Those files are not necessarily consciously-stored information.

Ogedei Khan has been doing what is expected of any Mongol warrior in his over-drinking. He does not notice it consciously, but in the back of his mind he sees a correlation between alcohol consumption and the early deaths of his friends. One night his brain defrags that particular thought, and he dreams he is watching his friends die rapidly one after the other while drinking. A shaman he has never seen before walks over to him in his dream and tells him he will die young unless he takes better care of himself. Ogodai awakes a sadder and wiser man, swears off alcohol, and in consequence lives past the year 1241.

The result is that the Mongols continue on through Europe. They easily take the collection of feuding principalities and postage stamp-sized countries that comprised what is now Germany, Austria, and Italy. Those areas were divided and disorganized, loath to assist each other, and happy to see their competitors destroyed, not thinking what would happen next.

The Mongols use their favourite strategy of divide-and-conquer, knocking off European countries one by one. They picked up fire projectile weapons from the Chinese conquest, although they apparently did not have rockets yet [4]. Each battle begins with a sheet of flame preceding the horsemen, and then the familiar butchery and subjugation.

The Mongols would not go on all the way across Europe. They had overstretched supply lines, and destroyed too much of the land they conquered to live off it. They were also starting to quarrel within themselves. The Golden Horde ran out of energy in Spain and France, and never bothered trying to cross the English Channel. That would do for some other day and some other khan.

The Mongols recognized their inability to govern a far-flung empire, so their standard practice was to use genocide to keep the buffer states from recovering and retaliating. Populations were reduced by millions and cultures deliberately destroyed, thus ensuring the conquered country would not be a future problem for many years to come [2].

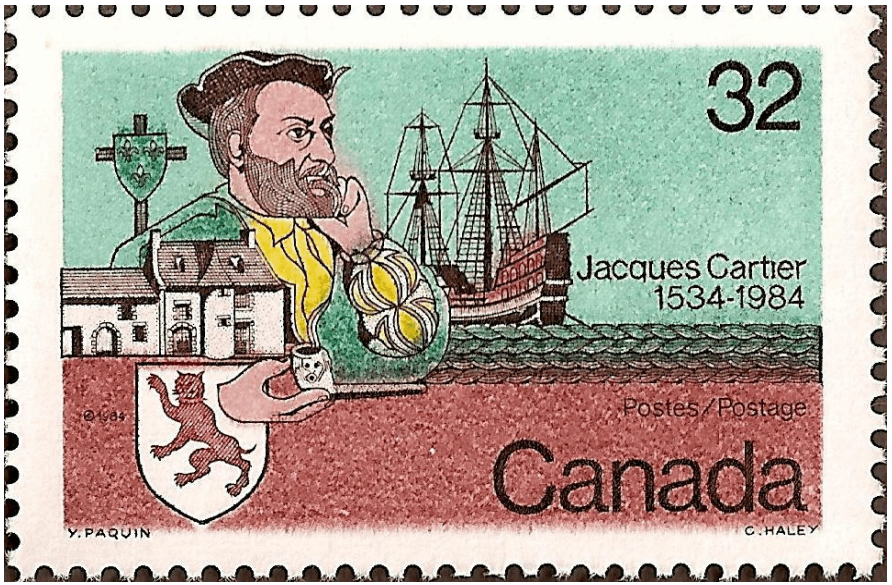
The Consequences.

In Europe, the result would be no Renaissance, just as China and Persia had their cultures crippled. The Mongols also introduced diseases into Europe which were damaging enough in our timeline [3] but which would be the coup de grace for continental European civilization after the genocide.

The centre and remnant of civilization would shift to England and Scandinavia, reasonably well protected by water barriers. English sea power is expanded ahead of schedule from fear of the Golden Horde crossing the Channel. A much earlier ocean-going England thus begins accumulating its overseas empire that much sooner.

Scandinavia is more tied down because they still have to deal with Mongol hordes coming in overland from the east, although the Mongols are not as successful. Horse nomads must fight dismounted in the fens and forests of Suomi, and by the time they get to Norge, if they do, they have little left beyond raiding parties.

The Newe Founde Land is colonized in the 1300s, two centuries ahead of schedule. By the late 1400s, the English have worked their way down the North American coast into the Caribbean. France, Spain, and Portugal have all been crippled by swarms of Mongols and are in no condition to compete, so the Americas are entirely Anglo.



One minor exception may be Terranabes, with its large complement of Basque fishermen. They were not troublesome to the British, and the two probably could have settled on a deal to allow the Basques to settle Terranabes/Newe Founde Land and fish the Grand Banks in exchange for acknowledging British sovereignty. The festering sore of New France/Quebec never was, thanks to the Mongols.

South America is colonized by the English in the 1500s. A few storm-tossed ships learn the hard way about the Atlantic conveyor belt currents. Once the currents are figured out, colonization becomes faster and less troublesome. Africa is soon explored, and colonies begin springing up along its coastline in the late 1500s and 1600s.

The wealth of the colonies starts pouring into England. The continental Mongols are no longer the major threat they once were because they have split into several quarrelsome khanates, but they are still as vicious as back when. England does not and cannot waste its new wealth on excessive luxury. The monarchy does enjoy its good life, but most of the money goes into a stronger and faster navy, and a powerful professional army and marines force designed to protect against Mongol raids and to keep the peace in the colonies. Technological innovation is sped up by war, as it is in our timeline.

The population of Britain grows faster than in our timeline, as economic prosperity and jobs for everyone (even if only military jobs) allows the King the indulgence of a constitutional monarchy that much sooner. The common threat of the Mongols encourages mass literacy and education, recognized as the best long-range strategy against horse barbarians.

By the 1700s, the Mongol threat has dissipated, as the hordes split apart, are absorbed by their victims, and are swamped by the more populus agrarians. This is why the Mongols never destroyed China; there were just too many Chinese for even the strongest horde.

The Longer Yet Consequences.

The British Empire is far stronger and larger in this alternative timeline. Fear of the Mongols in the early stages kept them out of wasteful European wars. The investment in overseas colonies has paid compound interest in the form of complete domination of the Newe Founde Lands (the Americas) and Africa. As the Mongols fade away in the 1700s, Britain moves into Europe.

Northern France is an easy addition to the Empire, and secures the opposite coast of the English Channel. The English set up buffer states throughout Europe, it being harder to pacify semi-civilized Europeans than American or African natives. The constant harassment of Rome by Mongols meant the Church moved to Ireland, out of range of the Mongols and safely in range of the English. God may or may not be an Englishman, but the Pope certainly is.

Steam technology developed about 50 to 100 years earlier than in our timeline, as a result of a technological arms race to counteract the Mongol hordes. In the middle 1800s, motor vehicles appear. Heavier than air travel becomes a reality in the 1870s. There are no large European or world wars in the 1900s, but lots of brushfire wars with restive natives in colonies, Mongolized Europe, and Asian powers. This keeps British technology humming along, especially in communications and transportation, the two most essential factors in keeping a world-spanning empire together.

China and Japan are the major powers in southeast Asia. The English can hold Australia because it is far enough away, and unappetizing to the Chinese and Japanese. England tries to keep China and Japan preoccupied with their own brushfire wars in places such as Korea and Vietnam. Since England is not a direct combatant in Asia, there is no real arms races between any major powers in the world. There are thus no world wars but unfortunately no space race either. The technological advances of England are earthbound ones such as motor vehicles and aircraft, not high-tech ones such as spacecraft.

Mongolian/Chinese rockets are being experimented with by English scientists but the space programme is far behind our timeline. The first satellite is not launched until the 2050s, and only then out of scientific curiosity. The first moon landing is in July 2069. The first man to step on the Moon is Group Captain Nigel Armstrong of the RAF. His famous words ring down through history: "*That's one small step for a man; one giant leap for the British Empire. God save the King!*"

References.

1] Nicolle, D. (1990) The Mongol warlords. Published by Firebird Books, England. Page 11.

2] Saunders, J.J. (1971) The history of the Mongol conquests. Published by Routledge & Kegan Paul, London. Pages 72 to 89.

3] Thorndike, L. (1927) The blight of pestilence on early modern civilization. AMERICAN HISTORICAL REVIEW 32:455-474

4] Winter, F.H. (1990) The genesis of the rocket in China and its spread to the East and West. HISTORY OF ROCKETRY AND ASTRONAUTICS 10:3-23

5] Turnbull, S.R. (1980) The Mongols. Published by Osprey Publishing, London. Pages 31 to 39.

6] Christian, D. (2000) Silk roads or steppe roads? The Silk Roads in world history. JOURNAL OF WORLD HISTORY 11:1-26

Meanwhile, Centuries Later ...

May 28, 1940: London: Lord Halifax resigns from Churchill's government, stating that the prime Minister's refusal to speak with the Germans about a armistice are going to 'lead us down the slippery slope to defeat.'.

What Happened in Our Timeline.

May 1940 was the nadir of the war. The month began with Neville Chamberlin discussing his resignation on May 9 with Churchill and Lord Halifax, the two dominant political figures of British politics. The only decision taken was that Halifax would not succeed him because all agreed that the new Prime Minister should lead from the House of Commons [1]. Lord Halifax could not do it because a peer cannot sit in the Commons, although they can be cabinet ministers from the House of Lords.

Halifax himself said in his autobiography [3] that he declined the Prime Ministership because he did not think he would be effective leading the government from outside the Commons with Churchill as Minister of Defense. He agreed to serve as Foreign Minister but asked to be relieved as party leader in the House of Lords.

Chamberlin resigned May 10, after Labour M.P.s said they would not serve under him in a war coalition government [1]. Churchill became Prime Minister. While Halifax served as a cabinet minister, he felt that Churchill was too emotional instead of working things through logically. After a cabinet meeting on May 27, Lord Halifax wrote [4]: "*At the 4.30 Cabinet we had a long and rather confused discussion about, nominally, the approach to Italy, but also largely about general policy in the event of things going really badly in France. I thought Winston talked the most frightful rot, also Greenwood, and after bearing it for some time I said exactly what I though of them, adding that if that was really their view, and if it came to the point, our ways must separate.*". But their ways did not separate, at least not in our timeline.

The Dunkirk evacuation from May 26 to June 4 was nail-biting suspense. Belgium surrendered on May 28. The two dominant figures of the British cabinet, Churchill and Lord Halifax, were at loggerheads with each other. Lord Halifax felt better terms of peace might be obtained from the Germans before France fell, but Churchill was opposed [2]. Halifax's view was based on the weak military position of Britain. He felt as far back as 1938 that the war could be lost due to the lack of preparation [4]. He mentioned in his autobiography that: " *... in the event of war in 1938 South Africa had decided to remain neutral, a powerful opposition in Australia had declared against participation, and the attitude of Canada was, to say the least of it, uncertain. So the British Commonwealth which was unanimously behind the war in September 1939, would certainly not have been united for war in 1938.*" [3].

Hitler decided the issue by holding back the Panzers, allowing the successful evacuation of Dunkirk. Britain escapes in a close call, a very implausible point of divergence. Who could seriously imagine that a powerful army stops for no better reason than the whim of a dictator?

What Happened In The Other Timeline.

Dunkirk was a devastating blow, one worsened when Lord Halifax resigned and weakened Churchill's position. Hitler is encouraged by the public dissension. Der Fuhrer cancels his order stopping the Panzers from wiping up the Allied Expeditionary Force. They spring into action. The results are not as spectacular as they might have been if they had captured the entire force a few days earlier but are bad enough. The British Army is crippled. Lord Halifax has made a self-fulfilling prophecy. Britain must sue for peace.

Europe becomes Fortress Europe. Britain stays neutral against Germany for the rest of the war. So does the British Commonwealth, for the Dominions are not going to fight the Germans if the Mother Country won't.

This is bad news for Japan, since the Commonwealth, and Britain, will definitely come to the aid of Australia and New Zealand. Canada can now put in more forces to replace the soldiers it lost in the Hong Kong disaster. With the Commonwealth packing a far heavier punch in the Pacific theatre, the USA also has an easier time of it.

Japan's war is shortened when the superior opposing forces push it back from the conquered islands sooner than in our timeline. However, everyone hesitates

to attack the home islands, knowing full well what the horrific cost will be. The atomic bombs are not yet ready, so the Pacific war goes into a war of attrition. The Allies try to starve out Japan, and do well at it, the only problem being the leakage from Japanese-occupied China. The rush is on to avoid the expense of a long drawn-out war like World War One. The atomic bomb is not tested in some Nevada desert but is tested over Hiroshima. Even if fission doesn't ignite, the conventional explosives will blow the plutonium into powder and contaminate the area. But it does work, and the war is over much earlier.

Back in Europe, Hitler pushes his luck too far with Operation Barbarossa, a simultaneous stepped-up attack on the Scandinavian countries, and more troops into the Mediterranean. Britain may have surrendered but Stalin didn't. He has a harder time of it resisting the Germans, since he does not have the same economic aid he got from Britain and Canada in our timeline. Moscow falls, but proves an expensive victory for the Germans, who are now strung out all over the map, facing hostile populations, and discovering that Russian winters are worse than German winters. Fortress Europe is expensive to garrison as well.

Russia counterattacks much as it did in our timeline but not until 1946 at the earliest. However, there are no Allied troops in Europe acting as a counterbalance from the other direction. Russia gets further west than it otherwise did. What it can't occupy directly, it will control via local communist parties. Fortress Europe becomes part of the Soviet Union.

References.

1] Smart, N. (1998) Four days in May: The Norway debate and the downfall of Neville Chamberlin. PARLIAMENTARY HISTORY 17:215-243

2] Mercer, D. (editor) (1990) Chronicle of the Second World War. Published by Longman Group, England. Pages 89 to 90.

3] The Earl of Halifax (1957) Fulness of days. Published by Collins, London. Pages 205 and 219

4] The Earl of Birkenhead (1965) Halifax: The life of Lord Halifax. Published by Hamish Hamilton, London. Pages 425 and 458.

In Yet Another Timeline ... The Khanate Of The Swastika

In May 1940, Britain stood alone against the Golden Khanate, the descendent of the Mongol hordes that had shattered Europe seven centuries before. Genghis Hitler had, over the decade before, eliminated his rival hordes and unified most of Europe under the Golden Khanate. It was a paradox that Hitler preached the superiority and racial supremacy of the Mongols but was himself an Austrian usurper not of Mongol blood.

Britain felt confident of withstanding the Golden Horde, having its colonies and Dominions to assist it. When Lord Halifax resigned from the Churchill government, Hitler saw it as a sign of the weakness of the British. The Khanate's invasion force was not properly prepared and equipped but that didn't bother Hitler. He ordered the invasion of the British islands and unleashed the U-boat wolf packs.

It is a bloody war, and the British, who withstood the original horse nomads, have great difficulty against Mongols in Stukas and ME-262e jet fighters. The invasion forces had their path smoothed for them by an intensified attack of V-2 missiles, with thousands falling on British factories in the space of a day. This used up the entire stock that Hitler had saved, but he didn't mind. It softened the British targets, and the thousands of V-2 staff were immediately diverted to other jobs, freeing up manpower.

A House Divided.

An incredible happenstance then altered the course of history. Djugashvili Khan, leader of the Red Horde and acknowledged as the Great Khan, died

suddenly of a stroke. Hitler wanted to be the new Great Khan, but that required he be present at the election with an army behind him to persuade the other khans to vote for him. The Golden Horde, having crippled Britain and within days of destroying its culture forever, voluntarily withdrew, and turned east to Muscovy. No one writing an alternative history would be believed if he wrote that sort of thing into his scenario, but that is what happened in the real world.

As it turned out, the Golden Horde never returned. They became embroiled in the endless struggles for power among the khanates. Over the next several decades, they squandered their ability and resources in intramural fighting. The British, given the worst scare of their lives, re-grouped and re-armed. Yurt Europe, as the Mongols called their fortified continent, stayed under the domination of the Mongols for a while, but eventually began to break apart. These endless squabbles are too tedious to detail here, but suffice it to say that Britain made certain to encourage the Mongols internal feuds. A house divided cannot stand.

DOWNTOWN COWTOWN: THE BOW RIVER CHANGES
by Dale Speirs

The Bow River flows through the centre of Calgary and forms the north boundary of the downtown core. During the great flood of June 21, 2013, many streams in southwestern Alberta changed course. The Bow River had many such changes inside Calgary. Islands that had been there since the city was founded in 1875 disappeared, while new ones rose up. The river is quite placid once it leaves the adjacent Rocky Mountains, but after the flood, it got its first set of rapids inside Calgary, on the lee of Louise Bridge. Nothing to frighten a voyageur mind you, as the rapids are about the area of my living room floor, but apparently a few Cowtowners are body surfing in the ice-cold glacial water. I've seen bigger ripples when I let out the bathtub but it doesn't take much to amuse some people.

I took this photo from a pedestrian bridge underneath the LRT bridge, looking west upstream at the Louise Bridge. The rapids can be seen at left just downstream from the bridge.

This gravel island did not exist on June 20, the day before the flood. Before the flood there was only a tiny gravel bar on the upstream side, where the cottonwood is at river centre.

Looking downstream towards Peace Bridge at the rest of the new island. The downtown core is at right, screened by cottonwoods.

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: Lloyd Penney 2014-09-30
Etobicoke, Ontario

Re: OPUNTIA #283 Beautiful pictures. I remember how some of the logging roads we used to travel on Vancouver Island looked, especially if you were driving close to a partially logged area, and you could see some great sights. Even in Toronto, there are sights you have to be in by an early time to properly enjoy, and avoid the rush of people who also want to be there. I am thinking Gzowski Park in the west end, and Bluffer's Park in the east. We will go to those parks for picnics.

[One reason why I spend so much time in Kananaskis is that it is a provincial park that the mobs of tourists in the adjacent Banff National Park don't visit. In Banff NP, to visit Johnston Canyon, Lake Louise, or Lake Moraine, you have to be there before 09h00 to find a parking spot. By noon the tailbacks are kilometres long, and you will be shoulder-to-shoulder with coach parties blocking the trails so they can take selfies.]

Re: OPUNTIA #284 More great pictures. The TTC has started operating its new streetcars on the 510 Spadina line, and the Calgary Transit trains reminded me of them. The new articulated streetcars will be rolled out on the city's streetcar routes over the next three years.

[There is talk that the proposed North Central and Deep South lines of the Calgary LRT will use streetcars that are boarded at ground level, rather than from a platform as with the existing system.]

Re: OPUNTIA #285 Again, more great pictures. So many people thought Edward VIII a complete idiot for wanting to discuss terms with that nice Mr. Hitler, but who knows what would have happened if he'd stayed on his throne. Wallis Simpson wouldn't have been Queen, just like Camilla Parker-Bowles will not be Queen should Charles rise to the throne. We've been talking about this recently; what will the reaction be when Elizabeth II finally passes away? For many of us, she is the only sovereign we've known.

[Indeed. She came to the throne in 1952, three years before I was born, and since the women in her family live into their 90s or beyond, she could possibly outlive almost everyone who remembers her father on the throne. Edward VII, when still a prince, once remarked that he didn't mind praying in church to an Eternal Father, but he was getting tired of his eternal mother.]

Drones are causing problems around many airports. As you say, do not blame the drones, but the idiots who fly them too close to flight paths. I can see in the future airport security police shooting down the drones to keep the airport facility safe.

[In Calgary, our airport has been having problems with idiots shining laser pointers at passenger jets.]

Milt Stevens says that FAPA is on the brink of folding? A shame. We are starting to realize that as we age, fandom as we know is on its way out, and all the traditions we know of and enjoy will soon be only our own fond memories. We hate to think it, but time has marched on, and our time is done.

[I don't like it either but have been forced out of the Papernet by the changes. It doesn't matter what I think; the future belongs to the next generation lining up at comic cons and paying hundreds of dollars to gush over a television star. I'm hoping the pdf format will last a few generations.]

FROM: Ray Palm 2014-10-08
Plattsburgh, New York

You mentioned in OPUNTIA #285 you couldn't get the right color using your computer for a shot of boulders spread out near a creek. The problem is open shade conditions. Your camera sensor (or film) is color balanced for sunlight and so colors look OK in direct sunlight. But with open shade the primary source of illumination is the blue sky, not the sun. Ergo a blue cast.

Were you shooting film or using a digital camera? Most digital cameras have color balance settings including one for open shade: it's indicated by an icon of a building with a deep shadow next to it. You have to remember to reset the camera to automatic color balance (or sunlight) after you leave open shade areas or everything will be too yellow. A mistake I've made when in a hurry.

[I use a Nikon D80 digital single-lens reflex camera. I was trying to adjust the photos on my laptop and it never occurred to me to think about the camera settings. I shall have to sit down and read through the camera manual again. I read through it last when I bought the camera in 2006 and set it to landscape modes and disengaged the automatic defaults.]

Your photos look good, even with a larger screen (a 15.4 inch laptop as opposed to my 7 inch tablet). And since they're digital, full color, without the cost prohibitive factor of doing the same with a paper zine.

[I use my Samsung smartphone for quick snapshots around town, but take the Nikon for those times where I know in advance that I will be taking a lot of photos, because it can go for weeks on one battery charge. In 2012, the first year I had my smartphone, I figured I could mothball the Nikon because it was handier to have a camera in my shirt pocket instead of a big heavy SLR and telephoto slung around my neck. That year, I left the Nikon at home for the Stampede parade, which lasts three hours, and instead used my smartphone. By the time the parade ended, the smartphone was down to 1% battery power.]

[The other thing I discovered was that smartphones use digital zooms rather than real telephoto lenses. The digital zooms are grainier. Another reason, therefore, why I lug the Nikon out to the mountains, because the telephoto lens will provide high quality long-range resolution. When I'm photographing in the Rockies, it is very common for me to use a telephoto lens from a kilometre away, something that a smartphone simply couldn't do.]

SEEN IN THE LITERATURE

Koski, J.V., et al (2014) **Experimental realization of a Szilard engine with a single electron.** PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES USA 111:13786–13789

Authors' abstract: "*A Maxwell demon makes use of information to convert thermal energy of a reservoir into work. A quantitative example is a thought experiment known as a Szilard engine, which uses one bit of information about the position of a thermalized molecule in a box to extract kBT ln 2 of work. The second law of thermodynamics remains valid because, according to Landauer principle, erasure of the information dissipates at least the same amount of heat. Here, we present an experimental realization of a Maxwell demon similar to a Szilard engine, in the form of a single electron box. We provide, to our knowledge, the first demonstration of extracting nearly kBT ln2 of work for one bit of information.*"

Speirs: This one's tricky, and I'm not sure I can explain it correctly but here goes. The Second Law of Thermodynamics is about what we call entropy. Work can only be done with some sort of gradient between two things, usually a temperature, electrical, or pressure difference. Over time, a self-contained system with no outside inputs of energy will become entropic and come to a stop because there are no heat or pressure differences to do any work with. Batteries go dead, heat engines cool to a uniform temperature, or pressures equalize and prevent hydraulic movement.

One of the founding fathers of modern physics was James Maxwell, who proposed a thought experiment. Imagine a box with two insulated compartments filled with gas molecules, and a hole between them that is monitored by a demon to allow only fast-moving (hotter) molecules through to the other side and slow molecules (cool) in reverse. Over time this would result in one compartment heating up and the other cooling, an apparent violation of entropy. The argument against this, originally by Leo Szilard, was that the demon would use energy to measure the speed of the molecules and block them if necessary, which would create entropy and counteract the sorting of molecules. The entire system would therefore still have entropy and eventually run down.

Rolf Landauer calculated that the information about each molecule's speed would enable the demon to store it indefinitely and thus violate entropy. The

energy stored as information would not be dissolved into uniformity within the box, and thus escape entropy. Charles Bennett later pointed out that no matter what the conditions were inside the box, eventually the demon would run out of room to store the bits of information and have to erase some of them to make room for new measurements of molecule speeds. Erasing bits of information would release energy and reactivate entropy. So you still can't win.

This paper reports on a nanotechnology experiment to build an actual Maxwell demon/Szilard engine using one electron. It may mean something to somebody some day. Since entropy always wins in the long run, the technical applications might not provide perpetual motion but they could stall entropy long enough to produce a more durable battery.

Faria, N.R., et al (2014) **The early spread and epidemic ignition of HIV-1 in human populations.** SCIENCE 346:56-61

Authors' abstract: "*Using statistical approaches applied to HIV-1 sequence data from central Africa, we show that from the 1920s Kinshasa (in what is now the Democratic Republic of Congo) was the focus of early transmission and the source of pre-1960 pandemic viruses elsewhere. Location and dating estimates were validated using the earliest HIV-1 archival sample, also from Kinshasa. The epidemic histories of HIV-1 group M and nonpandemic group O were similar until ~1960, after which group M underwent an epidemiological transition and outpaced regional population growth. Our results reconstruct the early dynamics of HIV-1 and emphasize the role of social changes and transport networks in the establishment of this virus in human populations. ... Shortly after the first reports of AIDS in the United States in 1981 and the isolation of HIV-1 two years later, the disease was discovered to be established in heterosexual populations of central and east Africa, suggesting a much older, and, to that point, hidden, history of the pandemic in Africa*."

Speirs: AIDS has been pushed off the front page by Ebola, but both follow similar lines of development. There is a long period of time in which the virus slowly spreads within the local population, then suddenly tips over into a local pandemic, and then, thanks to modern air travel and a long incubation period, a global pandemic.

Wiessner, P.W. (2014) **Embers of society: Firelight talk among the Ju/'hoansi Bushmen.** PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES USA 111:14027–14035

Author's abstract: "*Much attention has been focused on control of fire in human evolution and the impact of cooking on anatomy, social, and residential arrangements. However, little is known about what transpired when firelight extended the day, creating effective time for social activities that did not conflict with productive time for subsistence activities. Comparison of 174 day and nighttime conversations among the Ju/'hoan (!Kung) Bushmen of southern Africa, supplemented by 68 translated texts, suggests that day talk centers on economic matters and gossip to regulate social relations. Night activities steer away from tensions of the day to singing, dancing, religious ceremonies, and enthralling stories, often about known people. Such stories describe the workings of entire institutions in a small-scale society with little formal teaching. Night talk plays an important role in evoking higher orders of theory of mind via the imagination, conveying attributes of people in broad networks (virtual communities), and transmitting the "big picture" of cultural institutions that generate regularity of behavior, cooperation, and trust at the regional level. Findings from the Ju/'hoan are compared with other hunter-gatherer societies and related to the widespread human use of firelight for intimate conversation and our appetite for evening stories. The question is raised as to what happens when economically unproductive firelit time is turned to productive time by artificial lighting. ...*"

"*When the night appears to have really mattered was for the extension of cultural institutions over time and space to link individuals from different bands into larger "imagined communities" beyond village limits, an enterprise that involved complex cognition and time-consuming information transfer. ...*"

"*The multibillion dollar publishing industry dominated by sales of stories, fiction, science fiction, history, and biographies, together with the much larger film industry attest to the power of stories. Like hunter/gatherers, we work our imaginations, gain new perspectives, and expand our horizons from stories. Even so, artificial light and digital communication are invading the night worldwide, turning hours of darkness into economically productive time and overriding social time and story time. The day then ends with the flip of a switch, without taking the time to revisit, explore, ponder, and repair relationships, or let the issues of the day fade with the embers.*"

And just to provide a symmetrical finish to this issue, a telephoto shot of a squirrel at Wedge Pond, Kananaskis, about 100 km northwest of Brown-Lowery Park. This one didn't chatter at me.