

# OPUNTIA

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Whole-numbered OPUNTIAs are sercon, x.1 issues are reviewzines, x.2 issues are indexes, x.3 issues are apazines, and x.5 issues are perzines. A cumulative subject index for all issues is available on request.

### WAY DOWN YONDER: PART 2

by Dale Speirs

There are many hollow Earth books and movies, and journeys to the centre of the Earth, not necessarily the same thing. Part 1 discussed the variations on a theme by Jules Verne, all of which involved characters trundling down to the centre on foot. That is quite a hike, hundreds or thousands of kilometres, although in Verne's novel they didn't actually go all the way in. Part 2 looks at the use of drilling machines to get to the centre of the Earth.

Edgar Rice Burroughs needs no introduction as an author. He wrote a series of hollow Earth novels set in Pellucidar. The first was AT THE EARTH'S CORE, originally serialized in a magazine and published as a novel in 1914. Access to the underworld was by a drilling machine, with many adventures down below. As far as I can tell, this was the first story that used a machine to go down below.

I have a fondness for the 1951 movie UNKNOWN WORLD, which attempted to update Verne by having the explorers trundle down into the planet with a drilling machine. This movie was made in the dawn of science-fiction movies, where SF is defined as a reasonable attempt to use plausible technology. Most movies of that era which today are labeled as SF were more correctly monster or fantasy movies.

## Game Over -- You Win



Molten core	Verne	Obruchev	ERB
0	26	26	26
0	52	52	52
0	78	78	78
0	104	104	104

OK



THE CORE takes note of the one thing none of the JOURNEY TO THE CENTRE OF THE EARTH versions do, that the Earth's centre is molten. To be fair to Jules Verne, if you read the novel closely, the explorers in JOURNEY never actually made it to the centre of the Earth. THE CORE is a rousing disaster movie where life on Earth as we know it will cease unless the heroes can reach the core and detonate some nukes. The science is fantasy, of course, but it does have Hilary Swank and lots of end-times special effects.

DESCENT is a 2005 movie that begins with a military project called Project Deep accidentally activating all the subduction plates around the edge of the Pacific Ocean. This will trigger mass vulcanism and the end of life on Earth as we know it unless the heroes can reach the plates' bending point 20 miles below the surface and detonate some nukes. There is a nod towards the fact that rock that deep is molten but mostly the drilling machine trundles through old mine stopes and lava tubes, with the occasional spot of drilling. The science isn't any better than THE CORE, but you knew that anyway.

I often wonder where we would be without nuclear bombs. If they're not mutating insects into giant monsters, then they're diverting the magma into a new channel. It happens that since nuclear weapons got going in the post-war public consciousness about the same time as did modern SF movies, it is difficult to perceive one without the latter. For that matter, if there were no nukes in the 1930s, how was it that King Kong mutated? Mustard gas? Somewhere in here is a good alternative history. But that is off topic, so let us move on to the subject at hand. Look out below!

**At The Earth's Core:** The narrator is David Innes, heir to a mining fortune, whose faithful retainer is a mining engineer named Perry. The latter has invented a drilling machine which they decide to test together in secrecy before unveiling it to the world. The machine can drill through solid rock at the rate of 7 mph, which is fabulous even today. Molten core? That objection is disposed of by some hand waving that it isn't all that hot down there and current geological thinking has got it all wrong.

**Unknown World:** This movie, made at the height of Cold War paranoia, begins with an earnest lecture by Dr. Jeremiah Morley about the hazards and inevitability of nuclear war. He considers that the human race is doomed, and decides to save at least a few of the brightest and best in an underground refuge at the centre of the Earth. He assembles a team with the idea of finding such a refuge. Molten core? That objection is disposed of by some hand waving that it isn't all that hot down there and current geological thinking has got it all wrong.

**The Core:** Disturbances in the Earth's magnetic field cause birds to lose navigational ability, people with pacemakers to die, and a space shuttle to veer off course and crash-land in the Los Angeles River. The Earth's core has stopped rotating. The magnetic field is generated by the rotation of the Earth's core, and without it the human race is doomed. The American military, led by General Thomas Purcell, assemble a team with the idea of finding a way to re-start the core. They decide to use nukes sent down into the core, the shock waves of which will re-spin the core and thus regenerate the magnetic field.

**Descent:** A military project called Project Deep, in the state of Washington, has gone wrong, triggering volcanic eruptions which spread along the Ring of Fire that surrounds the Pacific Ocean. A combination military/civilian team will drill down to detonate two nukes where the subduction plate bends, thereby squeezing the magma flow shut. Molten core? That objection is disposed of by some hand waving that it isn't all that hot down there and current geological thinking has got it all wrong.

**At The Earth's Core:** Innes and Perry start up the drilling machine, the Iron Mole, which runs out of control and, worse yet, cannot be steered off a vertical descent. Down they go through rock, then a thick layer of ice, then rock again, and finally at the 500 mile mark punch through into thin air.

**Unknown World:** Morley has located a network of tunnels going down from the cone of the extinct volcano Mount Neleh (a producer's in-joke; read the name backwards) in the Aleutian islands. The team of six men and one woman will travel down in a drilling machine called the Cyclotram, that looks like a cross between a late-1940s American sedan with tail fins and a tank, with a small drill on its nose. Morley can't get funding from any public foundation, but a newspaper magnate agrees to fund it in exchange for being able to accompany them. He also serves as the love interest for the woman.

**The Core:** A scientist is found who can build an articulated tubular vehicle with lasers in the nose to melt the way ahead and constructed out of unobtainium, a titanium/tungsten alloy which increases in strength with external pressure and insulates from heat. The boring machine is named Virgil, after the poet who descended into Hell. A team including astronaut Rebecca Childs and geophysicist Dr. Joshua Keyes will operate the vessel. General Purcell stays topside at the command centre.

**Descent:** A drilling machine called the Mole (even the scientists complain about how unoriginal the name is and want to call it the Hamster) will carry the team of five men and one woman down 20 miles to place the two nukes. Two of the men are Marines and will set the nukes. The woman is the only one who knows how to operate the Mole. The civilians are upset when one of the Marines is caught spying on how she operates the machine, but they have no answer when he points out that if anything happens to the woman, no one else will be able to run it. The machine uses energy beams and counter-rotating blades to drill through the rock.

**At The Earth's Core:** Innes and Perry find themselves in a strange tropical land. They are chased up a tree by a monster of some sort, and rescued by the intervention of man-apes with hunting dogs. The two men are separated and Innes taken captive. As he is carried away to an unknown destination, he philosophizes at length about life and death. ERB was paid by the word.

**Unknown World:** And so to the Aleutians, and a slow trundle to the top of Mount Neleh and then down into the crater and into the tunnels. As they crawl along the tunnels they stop at intervals for food (protein pills and water) or to scout ahead of the Cyclotram on foot. As they stroll down the tunnel, their conversations develop their characters, cliches all of them. They find a plaque left by the Engstrand expedition of 1938, which basically says go no further because here be dragons. The crew start up the drill on the nose of the Cyclotram and go further, stopping occasionally for "As you know, Professor" lectures and philosophical debates.

**The Core:** The Virgil is dropped from an oil rig over the Marianas Trench in the South Pacific ocean, which is not only the deepest place on Earth but also where the crust is thinnest. It drills through the crust and into the mantle, where it punches through a geode filled with giant amethyst crystals and crashes on the bottom. The lasers are damaged and can only be repaired from the outside. The crew don pressure suits, evidently very well made, and do the job. As they finish up, the commander is killed by a falling crystal as the geode cracks and magma starts to fill it up. They re-start Virgil and carry on into the mantle, waxing philosophical about life and death.

**Descent:** The Mole begins trundling down old mine tunnels and lava tubes. They set the first nuke at the 20-mile depth mark in a convenient cavern that happens to be in the correct spot. The crew don pressure suits, evidently very well made, and do the job. As they finish up, one of the scientists is injured by a falling rock. They re-start the Mole and carry on, waxing philosophical.

**At The Earth's Core:** Innes and Perry are taken captive by yet another species of man-apes, and find themselves with other humans. They learn the language and Innes falls in love with Dian the Beautiful. They go off on a long forced march and eventually are delivered to their true masters, the Mahar, a species of winged lizards. The two men make an alliance with a man-ape named Ghak to escape. Having survived the crisis, the three then fall to bickering about whether to go on or retreat. They all agree to retreat.

**Unknown World:** Two of the men grow tired of debating philosophy and decide to walk ahead of the Cyclotram. They are killed by toxic gas, which also contaminates the water supply. The crew goes searching for water and finally get some by bashing into a tunnel wall where they heard a rushing sound. This turns out to be live steam and burns the newspaper magnate. He survives, being the love interest, and the steam quickly condenses into fresh water. Having survived the crisis, the crew then fall to bickering about whether to go on or retreat. A one-vote majority says yes.

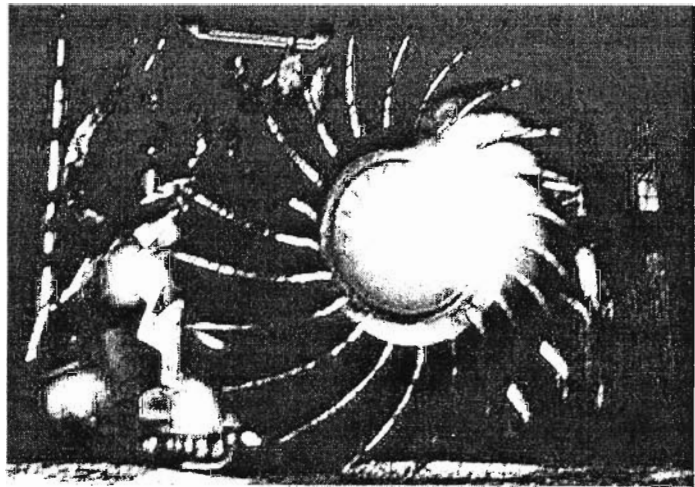
**The Core:** The next hazard in the mantle is giant diamonds the size of Cape Cod. The Virgil weaves through them, banging its fenders a bit. One diamond punches a hole in a compartment and another crew member bites the magma. From there the Virgil finally penetrates into the core, which turns out to be lower density than they thought. The nukes won't work because the core is too thin to propagate the shock waves. The crew fall to bickering about whether to go on or retreat. All but one vote yes.

**Descent:** The Mole suffers the effect of an earthquake associated with the subduction plates. Their original calculations as to where to set the second nuke are rendered null and void because the plate shifted. The crew fall to bickering about whether to drill blindly on or to wait for their slow computers to recalculate the second position. They wait.

**At The Earth's Core:** There are numerous alarms and excursions, and Innes seems to meet a new sentient species every other chapter. He is recaptured, and undergoes more alarms and excursions. There's never a dull moment in Pellucidar.

**Unknown World:** Further down, the Cyclotram punches through the rock into a sunless underground sea. Beaching on the shore for a rest, they catch some blind cave fish and squabble a bit more. A sunless sea is no place for refuge from nuclear war, so they carry on downward. Another crew member is thinned out from the herd by a fall off a cliff.

**The Core:** At this moment, General Purcell authorizes a re-start of Project Destiny (Deep Earth Seismic Trigger Initiative, or DEST-INI). This is a directed earthquake weapon, the previous run of which was inadvertently responsible for stopping the Earth's core from rotating. The Virgil crew races to re-set the nukes to detonate in a different pattern before Project Destiny is triggered and kills them. Two more crew members die for the cause trying to set the nukes properly.



**Descent:** We learn the general has authorized the Marines to kill the civilians after the last nuke is set to hide the secret that the problem was caused by Project Deep. One of the Marines dies for the cause trying to set the nukes properly. The other Marine has a change of heart. He and one of the scientists die trying to set the last nuke, also located in a convenient cavern. This thins the herd down to two survivors.

*The Hamster, from the movie DESCENT.*

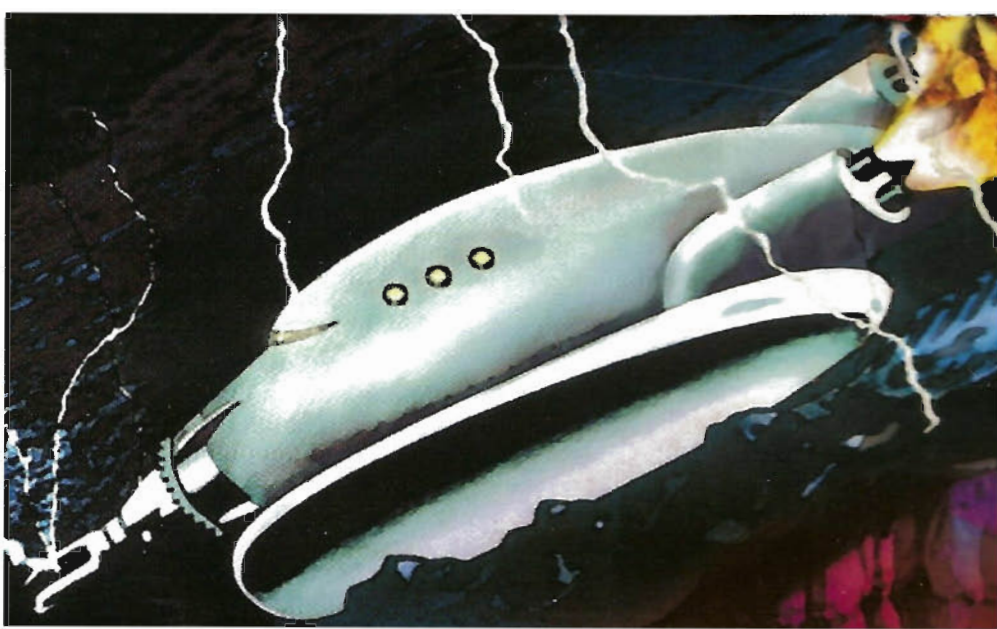
**At The Earth's Core:** Eventually the three escape again, with the usual alarms and excursions en route. Innes is reunited with Dian the Beautiful. Innes and Perry reach the drilling machine and set it up for the return voyage to the Earth's surface. Perry decides to stay behind to convert the natives to Christianity. Innes takes Dian with him, but after the machine is underway discovers she is not in it but a Mahar is. The machine surfaces in the middle of the Sahara. Innes is stranded but the novel concludes with him refitting the machine and heading back down to Pellucidar.

**Unknown World:** Eventually the crew break out into an immense cavern with a sunlit sea a la Verne. It seems like a refuge, but experimental rabbits brought along give birth only to stillborns. Further research shows the underground Eden renders life sterile. There will be no refuge here, so all agree to return. Since there is no place to hide from nuclear war, they resolve to work to prevent it, a dangerous sentiment considering that this movie was released in the Red-baiting era. Just then a volcano blows, the waters rise, and they scurry back to the Cyclotram. Morley gives up in despair and walks into the deluge. The three survivors make their way back to the surface via a vertical tube and surface near a tropic isle.

**The Core:** The nukes work and the planet is saved. The two survivors, Childs and Keyes, make it back to the surface by a hair-thin margin. They are rescued near Hawaii by a U.S. Navy aircraft carrier fleet, thanks to a pod of whales that drew attention to the Virgil. Project Destiny is subsequently exposed to the general public.

**Descent:** The nukes work, although their explosions look remarkably like gasoline explosions (the SFX budget must have run out). The two survivors make it back to the surface by a hair-thin margin. The Ring of Fire settles down and the world is saved. Project Deep is subsequently exposed to the general public.





*The Cyclotram, from UNKNOWN WORLDS. The movie poster artwork shows flaming rockets at the rear but in the movie these were just taillights.*

### **Rubber Suits And High Priests.**

There are other movies and books set below ground. **THE MOLE PEOPLE** is a 1956 black-and-white movie which begins with an earnest lecture by Dr. Frank Baxter, Professor of English at the University of Southern California. He is not a character in the

movie but an actual professor who was the Carl Sagan of his time. He expounds at length on the history of Hollow Earth theories, although why he should be an authority on it is questionable.

The opening scene of the movie proper is set in central Asia, the implication being from the establishing shots of towering snow-covered peaks that this is somewhere in the Himalayas. At an archaeological dig, a stone tablet is discovered embedded in sandstones. The head digger and hero of the movie pronounces it as having been deposited 5,000 years ago during Noah's Flood. This suggests that either he doesn't know any sedimentary geology or else is a creationist, probably both. The tablet has Samaritan cuneiform script on it, which is interesting because the Samaritans never went near the Himalayas. The message on the tablet is that anyone who disturbs the area, ie everyone on screen at the moment, is cursed. Even as they finish reading the tablet, an earthquake shakes the site. Never waste a good foreboding moment.

The quake was centred on Mount Kuhitara immediately adjacent. Off they go to the summit, where they find the ruins of a Samaritan temple decorated with Greek sculptures. One of the archaeologists falls to his death down a shaft. The others rappel down to verify that he is dead, there is another earthquake which collapses the shaft, and the three survivors find themselves trapped in a chamber at the bottom.

With no other choice, they go forward into a tunnel and find a giant cavern lit by phosphorescent rocks and containing an ancient city. They are taken captive by rubber-suit mole people,

transferred into the custody of albino humans -10- dressed like Robin Hood in short tunics, and thence to a temple decorated with Egyptian art and Greek statues. The men wear Ming the Merciless outfits, the King is dressed like a pharaoh and the women are in Greek togas. People got around in those days.

The High Priest is wise to the heroes right away and immediately sentences them to death, as anyone would. There is a badly choreographed sword fight and the heroes run away, as well they should. More alarms and excursions with the mole people, and one of the archaeologists is killed. He was an old geezer with chest pains, always slowing the others down, so his death comes as no surprise, and only the two youngest and handsomest heroes are left.

The heroes return to the underground city, where the High Priest has suddenly become friends with them and sets up a feast. He is up to some sly tricks though, and the plots and counterplots pile up, interspersed with romantic interludes between the leading man and a nubile blond maiden. There is an interminable display of belly dancing by a shapely maiden who relies on flashing her thighs and cleavage to distract the men from the fact that she can't dance. Just for nice, three other maidens are sacrificed by the High Priest by shoving them into the bottom of a shaft.

The mole people revolt, there is another pathetic sword fight (the swords keep bouncing off the rubber), and the heroes escape up the shaft. Back at the surface, they exult over their discovery, but before they even start back down the mountain, another earthquake takes place, collapses the shaft, and crushes the underground cavern and city. So much for scientific proof.

The plot of the movie actually wasn't so bad, but the science and the special effects were wanting. Even for a low-budget 1950s movie the costumes could have been better. It would not have cost any more money to use Chinese, Tibetan, and Hindu cultural references instead of dragging the Greeks et al from the Mediterranean.

## **BOOK REVIEWS**

by Dale Speirs

### **Depressing Events.**

THE GREAT CRASH 1929 by John Kenneth Galbraith (trade paperback, 2009 edition) was first published in 1954 and been continuously in print since. As Galbraith remarks in the revised foreword, every time it seemed the book would go out of print, a new stock market crash occurred and sent it back to the presses.

Galbraith notes that the economic decline which began the Great Depression started in early 1929, months before the infamous crash. Even today, the average person thinks the Panic of 1929 triggered the Great Depression but it was a symptom, not a cause. The actual crash was the result of too many speculators buying on margin, that is, buying stocks with money borrowed from the stock brokers. When the market made an initial slump, this set off a vicious feedback of lowered stock prices forcing people to sell off at below market price, which then depressed the stocks of other people on margin, who had to sell, and so on.

In reviewing the aftermath, Galbraith spends a few pages disposing of the popular misconception that pedestrians walking down Wall Street had to watch out for falling bodies. The suicide rate during the crash was not extraordinary, although it did climb during the 1930s as the depression ground onward without any end in sight. The crash also exposed numerous embezzlements that had been hidden by the good times, and many sharp-practice men were brought before the courts or legislative committees. As Warren Buffett remarked, it isn't until the tide goes out that you discover who has been swimming naked. What would have been a two or three year recession was lengthened to a decade by incompetent government and Wall Street responses.

## The Silver Lining.

Galbraith spends considerable time discussing and disposing of probable causes for the Great Depression. He concludes that the initial cause was excessive production like never seen before. Just about every manufactured good and agricultural commodity was so much in abundance that the markets were flooded with them. Manufacturers had to cut back and lay off staff, which set up a feedback mechanism that eventually drove the economy into the ground. Deflation is the deadliest of economic problems because there is no steady state for it. The disparity in incomes was also a trigger, with a few oligarchs holding one-third of the country's assets.

An international trade war magnified the intensity and duration of the depression, not only the protectionist tariffs but also the depreciation of currencies as everyone raced to the bottom. By June 1932, the bottom of the Great Depression, industrial capacity was down to 12%, the lowest ever recorded in history. Galbraith concludes that the length of the downturn was because the economy had not been sound prior to the crash, and was too weak to stage a recovery. Panics have occurred before in American history but were always over within a couple of years because the economy at that time was relatively strong.

Galbraith died in 2006, aged 98, and just missed the Panic of 2008, which would have happened in his centenary year. Life is full of little ironies like that.

David Morgan has been a silver trader for decades and is widely considered to be one of the masters of the subject. He self-published a book on the subject, GET THE SKINNY ON SILVER INVESTING (2009, trade paperback). It provides a good history of silver and the best advice on seriously investing in it, but could have used a bit of editing. It was obviously cut and pasted together from his Internet postings without too much attention to updating some of the older text, parsing the grammar, closing up blank lines, and old-fashioned details such as the difference between "its" and "it's". These details tend to jar the reader, but the content rises above the gaffes. I recommend the book anyway for those who can't afford gold and would like to invest in silver instead.

Silver is unusual compared to oil or gold. The latter two have supply overhangs in OPEC and the central banks respectively, while no central bank holds any significant silver. The gold bugs wage war with the central banks, who return the compliment, but the banks consider silver beneath their dignity and leave it to the tinfoil-hat bloggers. There are no huge stockpiles of silver, and much of it is used in industry and medicine (silver is a bactericide) and never recovered. Electronics such as cellphones and computers use it, and little is recovered.

In 1990, the silver supply from mining peaked, and since then the world has used more silver than has been mined annually. The difference was made up by stockpiles and scrap jewelry, so until a few years ago, silver stayed in the \$4 to \$5 per troy ounce range. Film photography had been a major user of silver, but just as it looked like a crunch might develop, digital cameras arrived and killed the film market, postponing Judgement Day for the silver bugs. As the stockpiles ran out, and then the scrap supplies, the price started to climb. Stocks crashed during the Panic of 2008 but have not returned to what they once were. Gold and silver briefly went down during the panic but are now back up to what they were and even higher. Silver has climbed into the \$20 range, and that has thrown the silver bugs into a frenzy of anticipation.

Another unusual aspect to silver is that most of it is produced as a byproduct from copper or gold mines. There are few primary silver mines left in the world, and 80% of all silver comes as a byproduct. This means that silver output depends on the price of other metals. A copper mine producing 1% silver sells its output at market as a byproduct. If the price of silver climbs, the mine won't increase copper production since the 1% silver is trivial.

Silver bugs are not without their own conspiracies. In chapters 4 and 5 of this book, Morgan turns the pages over to Ted Butler and Jim Puplava, who have long been voices crying in the silver wilderness and who even many of the silver bugs consider

extreme. They discuss silver leasing and other forms of short selling by private investment firms, which have depressed the price of silver and are designed to undermine their own customers. (Wall Street banks do this with stocks as well, in a process known as front-running.) Silver leasing involves selling silver you do not own, then paying the bank a nominal rate of interest on the silver while using the currency elsewhere. The real estate equivalent would be selling an apartment building you do not own, then renting out the suites at a high rate and paying the true owner a low rental income. It would of course be illegal, but the banksters get away with it because they can. Unfortunately for them, the rise in gold and silver prices has embedded them deeper and deeper into their deceptions. Fortunately for them, when (not if) default finally comes, they will shout "Too big to fail!" and be bailed out by the government. This is why the only good way to own silver is to take physical possession and store it in a safe-deposit box or hide it in your house.

Morgan discusses the best forms of silver to invest in, generally bars less than 100 ounces or as coins. It is possible for a retail investor to buy 1,000 troy ounce bars, which is what the big boys use, but there are special requirements for shipping and selling. More to the point, 1000 ounces is heavy, a bit over 31 kilogrammes, and difficult to carry in a briefcase without the bottom falling out.

Silver bullion is rare. Morgan points out that if all 300,000,000 Americans bought the world's available supply of silver, there would only be enough for about 3 ounces per person. Assuming half of Americans are children, the supply would only be 6 ounces per adult. And that assumes that the rest of the world isn't looking for silver as well.

investing in silver, you are buying stocks. Penny stocks in particular are to be avoided. These are stocks in companies which have a silver ore claim but have not yet successfully developed the mine. Most claims are unworkable, either because the silver concentration is too low or because it is too expensive to build the infrastructure for the mine.

Silver and gold are both available as bars and bullion coins (1-oz coins not meant to circulate). Silver has a third form that gold does not, that of junk silver. Until 1965, Canada and the USA both had circulating dimes and quarters made of silver, but then had to switch to nickel-copper alloys because the value of silver in the coins became greater than the face value due to the depreciation of their currencies. Junk silver is bags of circulated silver coins, not suitable for coin collectors because of their worn condition but still containing their original silver. Many investors buy them with the idea that even if the price of silver were to collapse below face value, they could still use them for their face value. In other words, junk silver is a stop-loss type of investment. Junk bags are heavy and awkward to handle. If you are a survivalist who believes the end is nigh, then this is what you would buy.

Morgan's conclusion is that an astute investor should be buying physical silver now before the sheeple wake up to what has been done to the world's money supply and what it will do to them. If you wait until gold and silver are on the front pages, and dealer stores have lineups, it will be too late. The time to buy silver will have passed.

Morgan discusses buying shares in silver mines or futures contracts on leverage (with borrowed money). He reminds the reader that if you buy shares in a silver mine, you are not



## Ah'm An Old Cowhand From The Rio Grande.

THE DAY THE COWBOYS QUIT by Elmer Kelton (originally published 1971; I have the 2008 mass-market paperback reprint) is a novel loosely based on a true story of Texas cowboys in the 1880s going on strike against working conditions. The story revolves around Hugh Hitchcock, a wagon boss on a syndicated ranch in the Canadian River area of Texas in 1883. The open range was fading away, cowboys were hired hands and not freebooters anymore, and few of them owned a pistol. Ranches were investment opportunities syndicated to easterners looking for good returns, and barbed wire was spreading across the land.

The novel opens with a dispute among cowboys at roundup time. In those days, ranches still grazed their cattle together on commons, and at roundup any calves would get their mother's brand. Unless, as this novel begins, mama cow has a poor brand that could either be the Figure 4 ranch for whom Hitchcock works, or the LR ranch. The dispute is settled but leaves the cowboys in a surly mood, soon to be exacerbated when the syndicate boss rides in with news of changes to work conditions, such as not letting cowboys run their own cattle with the company herd.

From there, problems develop as the ranch owners push the cowboys and the cowboys push back. Both sides are have sinners,

and it is not simply a matter of black and white. The cowboys have some successes, such as winning a local election for sheriff against the owners' candidate, and starting grassfires on syndicated land, which forces the owners to buy hay for the winter. But the cowboys are on the losing side and know it. Barbed wire was as unstoppable as any tide in history, and the rangeland way of life faded out.

## The Flatlanders.

Terry Pratchett's Discworld series needs no introduction to fantasy readers, so I won't give it one. His 1981 novel STRATA is about world builders constructing a new planet for colonists, using matter transmuter machines left over by a vanished race called the Spindles. The Company which builds the planets pays its staff in a currency called Days, which can be redeemed for life extension that allows people to live for centuries. It is the only real currency because matter transmuters can create anything else. Trouble arises when a man named Jago Jalo starts distributing perfect counterfeits.

Kin Arad, a Company supervisor, begins searching for him before he wrecks the global economy. She successfully destroys the magic purse, which Jalo mentioned he found on a flat world. She goes looking for it, finds it, and promptly crashes her spaceship.

The disc planet is an analogue of Earth but with a plethora of alternative histories. Arad and her crew commence an odyssey to the centre of the disc to find out who built it and why. Along the way they encounter Vikings, dragons, Beowulf and Grendel, the End Times, and the Second Coming.

A disc planet such as this could not be a natural phenomenon. The underside of the disk is coated with neutronium to provide gravity, and the water that flows off the edge of the discworld is recycled by force fields back to the hub. As Arad and her people journey inwards to the hub, it becomes evident that the technology needed to operate the discworld is slowly running down. When they reach the hub, they find that the computers and robots that operate the discworld are gradually deteriorating. Spare parts are increasingly difficult to get, things fall apart, and the centre cannot hold. The ultimate discovery is that not only did the Builders construct the discworld as a joke, they also constructed the entire universe before moving on.

This novel is an obvious precursor to the Discworld novels proper. Unlike the subsequent novels, this one is based on a thin veneer of rationality, with no magic about.

McKey, D., et al (2010) **Pre-Columbian agricultural landscapes, ecosystem engineers, and self-organized patchiness in Amazonia.** PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES USA 107:7823-7828

*"Whereas pre-Columbian people dramatically changed the distribution and abundance of species and habitats in some parts of Amazonia, their impact in other parts is less clear. Combining archeology, archeobotany, paleoecology, soil science, ecology, and aerial imagery, we show that pre-Columbian farmers of the Guianas coast constructed large raised-field complexes, growing on them crops including maize, manioc, and squash. Farmers created physical and biogeochemical heterogeneity in flat, marshy environments by constructing raised fields. When these fields were later abandoned, the mosaic of well-drained islands in the flooded matrix set in motion self-organizing processes driven by ecosystem engineers (ants, termites, earthworms, and woody plants) that occur preferentially on abandoned raised fields. Today, feedbacks generated by these ecosystem engineers maintain the human-initiated concentration of resources in these structures. Engineer organisms transport materials to abandoned raised fields and modify the structure and composition of their soils, reducing erodibility."*