

OPUNTIA

259

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SHAKING ALL OVER

by Dale Speirs

Alberta is in a tectonically stable area a kilometre above sea level where we have no worries about earthquakes, hurricanes, volcanoes, or tsunamis. Watching shows about earthquakes provides us with a bit of voyeuristic schadenfreude.

I don't like the standard version of special effects in earthquake movies and television episodes. This is to shake the camera and have the extras lurch back and forth. The camera shaking draws the attention of the viewer out of the story, in the same way that lens flare does when a camera tracks across the sun and reminds us that the production crew is there. Long-range shots of buildings crumbling and the ground heaving up aren't as bad, and since the late 1960s such effects have been reasonably good.

The Big One.

The classic film on the subject is EARTHQUAKE, a 1974 star-studded spectacular located in Los Angeles, California. It has a common failing of these types of movies of using too many sub-plots in order to keep all the stars gainfully employed. The movie starts off with the usual foreboding, a trembler that rattles a few dishes and bookshelves and prepares the stage. The film then immediately detours through all the set-ups for the sub-plots,

introducing in turn, the wealthy businessman with an alcoholic wife, a domineering father-in-law, and a mistress on the side, the maintenance staff at a hydroelectric dam above the city, a rough-and-ready street cop always in trouble with his superiors, scientists at a seismology lab, a trick motorcycle rider, and a supermarket cashier with a creepy manager who volunteers in the National Guard.

But finally the Big One arrives. The special effects are quite good for their time and believable. Buildings shake themselves down, people run about in panic, and their deaths are realistic. In the aftermath, the survivors tend to each other as best they can, and the damage cleanup begins. The movie switches back and forth between the subplots, as the cast face the various hazards that develop, from fallen powerlines to fire to digging through unstable rubble.

Meanwhile there's trouble at the dam; should they open the floodgates in case the dam collapses, or should they keep the water in the reservoir so firefighters can work? They open one sluice to slowly lower the level, but as night falls, cracks start to develop. An aftershock settles the issue, and the dam breaks, flooding the valley and the plains. There is one nice long shot of natural selection in action when several people try to outrun the flood down the valley instead of climbing up the slope to an easy escape.

This movie was part of a group of disaster movies that came out about that time, and did well at the box office. It is one of the more realistic ones of the group, and the quality showed up in the final product.

NATURE UNLEASHED: EARTHQUAKE (2004) decides that it is unfair for California to be hit by earthquakes in all the movies, so let's trash Russia instead. As the opening credits roll, a fault line opens a rift just outside the perimeter fence at Kasursk nuclear power plant. Having assured the audience there will be at least some SFX, the movie then sets up all the sub-plots. Two nuclear engineers who recently divorced each other are forced to work together. When the Magnificent Bickersons aren't arguing with each other, they are feuding with the power plant manager. The nuclear reactor is being retrofitted with something or other but the project is behind schedule and over budget. All of their kids, surly teenagers (is there any other kind?), are providing the idiots for the idiot plots, getting themselves into trouble because they won't listen to advice. The actors are so wooden they give the lumber industry a bad name, so you'll spend a lot of time fast-forwarding to the SFX, which were reasonably good. The movie was filmed inside an actual power plant, so the staging is real.

The initial shake caused a critical nuclear core incident. Computer screens suddenly start opening dozens of new text windows, which flash impressive looking code. Using freeze-frame, it

appears that the SFX crew just displayed source code from some word-processing software and looped it to repeat every few seconds. I doubt that nuclear reactor technicians are concerned with “PAGESIZE_STACKPAGESIZE_” or “ult MEM.TEXT/dev/consoleCH?etc?initpipe/” instead of “RADIATION LEVEL = Runforyourlife!”.

One shake follows another, each bigger than the last. The final quake cracks the containment core, causing the cooling water to drain out and the core to catch on fire. Not to worry because there is a backup water line. Except, of course, an aftershock cracks it. Plan C is to divert water from a river, and flood it down a subway tunnel. Except, of course, aftershocks keep collapsing the tunnel ceiling and walls. One of the SFX appears to be actual footage of a California shake, judging from English-language traffic signs announcing “Freeway Entrance”. Some nice shots appear of freeway ramps collapsing and vehicles flying off, including a Dodge Ram pickup that looks exactly like the one I drove at work during the 1990s. In the final shake, the cowardly power plant manager flees the reactor and leaves his people behind, but is neatly squashed by a falling concrete beam.

At a certain point, the screenwriters realized they’d better not stack the deck too heavily, so the characters are allowed to dig themselves out of the rubble and practice their emoting. A few of the actors have to make it across an elevator shaft, and no one is

surprised when a bit player falls to his death. The main characters survive to indulge in a group hug, although tough luck to the extras, most of whom weren’t even wearing red shirts.

Earthquakes As Weapons.

THE WILD WILD WEST was a mid-1960s television series set in the Old West, with Secret Service agents James West and Artemus Gordon carrying out orders from President Grant. They had their own special train and moved about from place to place chasing dastardly villains. They cleaned up criminal conspiracies in the Southwest, as this made location shooting cheaper for the Hollywood studio, and used or dealt with gadgetry that presaged the modern genre of steampunk. Some fans have tried to adopt this as retroactive steampunk but I don’t agree. The occasional use of gadgetry circa 1800s is not by itself automatic grounds for adoption into the genre.

“The Night Of The Human Trigger” is a 1965 episode from the first season. Visiting mad scientist Prof. Orkney Cadwallader, lately departed from Harvard University at their request, is generating earthquakes against specific towns in Wyoming, first giving them fair warning to evacuate. West and Gordon visit the town of Sentinel, just recently threatened with an earthquake. The threat is carried out.

The earthquake is so severe that not only does the camera shake but the film starts skipping frames, like a film projector gone bad. This definitely drags the viewer out of the story. However the propmaster does a good job shaking glass bottles off shelves and collapsing some ceiling joists.

Jump cut to Cadwallader, who joyously exclaims to his henchmen "*A howling success! Nature couldn't have produced a more peachy earthquake.*" (The actual quote; I replayed the DVD player to transcribe it.) All the victimized towns are on the same geological fault line in eastern Wyoming, and the Professor simply used judiciously placed explosives to trigger the fault.

West and Gordon soon tangle with Cadwallader's beautiful daughter Faith and her two idiot brothers who provide the comic relief. There are various alarums and excursions, and the survivors end up in the Professor's lair. He tortures West and Gordon with a lengthy monologue on his life and times, the master plot, and how he will set himself up as President of the independent Republic of Wyoming, pausing only to correct West on his grammar. Faith also gets in her complaints, mostly that she doesn't want to end up an old maid. This is a reasonable concern, given that no intelligent man is going to marry her once he sees his prospective father-in-law.

In keeping with time-honoured tradition, Cadwallader sets up an

elaborate death for West and Gordon instead of just putting a bullet through their heads. They escape, of course, but West is recaptured. The Professor learns from his mistakes, and so he sets up an entirely different elaborate death for West, which will also trigger the final apocalyptic earthquake. You will not be surprised to learn that West escapes again just as the earthquake is triggered, pausing only to watch stock footage of rock slides, shaky cameras focused on painted backdrops, and a prop rock that visibly wobbles like jelly after the event is over. The actors stand about normally instead of lurching back and forth across the stage, so there is that.

The earthquake fails to destroy its target because the Professor miscalculated, and he is brought to justice. We next see him in a jail cell, madly scribbling equations on the cell wall while trying to find his mistake. One clearly visible equation is $E=mc^2$, which, besides being three decades anachronistic, has nothing to do with earthquakes. Perhaps Harvard University had good reason to terminate Cadwallader's contract.

"The Project Deepphole Affair" is a 1966 episode from the Season 2 of THE MAN FROM U.N.C.L.E. It is about a THRUSH satrapy in San Francisco working on a device to generate controlled earthquakes. Ilya Kuryakin is trying to get Dr. Remington, a geologist who is the top authority in sedimentation, past THRUSH agents led by Narcissus Darling. They need him to solve a

problem with their project. There is a confused scramble at a hotel where Remington is being hidden, and THRUSH, who have never seen him, go after the wrong man. This unfortunate chap is a down-on-his-luck huckster named Buzz Conway, also hiding at the hotel as a result of some bad bets at the racetrack, which his creditors Tony, Vito, and Luigi would like to discuss with him.

U.N.C.L.E. decides to use Conway as an unwilling decoy for Narcissus to chase after while Remington is safely hidden. They follow the THRUSH agents to San Francisco and to the project manager, named Marvin Elom (spell that last name backwards). The project involves a drilling rig hidden inside a skyscraper owned by Elom Industries, which is to penetrate the crust and allow equipment to be placed downhole to generate a controlled earthquake. Elom soliloquizes about how he likes being down below where it is always cool and dark, evidently unaware that the bedrock heats up the deeper it is.

In an infodump, Elom informs Conway qua Remington that the purpose of Project Deephole is to trigger the San Andreas Fault and cause California to slide into the sea. How THRUSH profits from this is not explained, unless they are short-selling insurance companies on the New York Stock Exchange. Elom runs off stock footage of some very bad earthquake SFX from 1950s movies intermixed with newsreel footage of the 1964 Anchorage earthquake, and tells Conway that it was a preliminary test.

Conway is not a geologist, so he doesn't ask the obvious question that a geologist would: "The San Andreas Fault is a strike/slip fault slowly moving a thin slice of the coast of California sideways to the north. Why would that cause the entire state to fall into the ocean?"

It seems that Elom is also drilling without a wellsite geologist on the payroll, because the drill has hit a hard layer of sedimentary rock and won't go past it. That is why he wants advice from Remington, which is puzzling because a geologist specializing in sedimentology isn't competent to advise on drilling unless he worked as a roughneck. We see the drill bit, all shiny and clean. Elom obviously doesn't use drilling mud nor does he know why he should. Drilling mud lubricates the drill bit and its weight keeps any oil/gas from blowing up the pipe and causing a gusher. (Which is why the Deepwater Horizon disaster happened. BP was in a rush to complete the well and removed the mud before the wellhead pressure-control valves were fully in-line.)

Solo, Kuryakin, Narcissus, and the rest of the gang show up at Project Deephole, with the usual to-and-fro gunfights and slugfests. Meanwhile, the drill bit hits oil, and a gusher starts filling up the skyscraper. Serves them right for not using mud and a blowout preventer. Solo, Kuryakin, and Conway finish off the bad guys and send Narcissus to the slammer.

The epilogue, back at U.N.C.L.E. headquarters in Manhattan, neglects to mention what was done about a skyscraper filling up with crude oil. Presumably U.N.C.L.E. decided to cut and run, leaving the city authorities to clean up the mess.

THRUSH is not an organization to give up after one setback, which leads us to a Season 4 episode “The Man From THRUSH Affair” (1967). Solo and a temporary sidekick Andreas Petros infiltrate a Greek island where a THRUSH satrapy is up to no good. (Kuryakin was not in this episode; David McCallum, who played the part, was on his honeymoon.) THRUSH has spent \$3 billion on a secret project, to the astonishment of U.N.C.L.E. and no doubt the disbelief of viewers when the episode first aired. Back in the 1960s, a billion dollars was real money, not a rounding error in government accounts as it is today.

Dr. Killman (the script writers were not subtle) is the mad scientist in charge, and is feuding with THRUSH bureaucrats over his spending and lack of results. It doesn't seem to help that he is using unskilled villagers as slave labour. The views of the superscience machine show a beehive of activity, but half of the workers are just polishing the machine or carrying clipboards back and forth. A bunch of goldbrickers if ever there were any. No wonder Dr. Killman is behind schedule. After much skulking around, Solo and Petros discover the project's purpose; it is an earthquake machine capable of targeting and destroying any large

city. Before they can destroy the machine they are found out by THRUSH Central. Dr. Killman is a man with a mission and he isn't going to let either U.N.C.L.E. or THRUSH Central stop him. After the usual alarms and excursions, the machine is destroyed before it can be used. This leads to a rather anticlimactic ending, with just some electrical sparking from the dying machine. Like most mad scientists, Killman did not believe in hiring a journeyman electrician to install some circuit breakers. I was hoping to see those stock shots of Anchorage again, but no such luck.

Never The Twain Shall Meet After This.

10.5 APOCALYPSE is a 2006 television movie that decides why bother destroying just California, let's go after the entire continent. The opening sequences certainly start the show off with a bang, with the coast of California collapsing and a giant tsunami the height of Diamond Head washing over Hawaii. That was just the overture though.

But first, the usual detour through all the sub-plot set-ups. Since the producers can't blow the entire budget on special effects, they need a few actors in mundane stage sets to pad out the story. Not a problem; that is why God gave us fast-forward on DVD players. An attempt is made to sustain excitement in these drawn-out sequences by innumerable jump cuts every few seconds.

The real excitement resumes when a dead volcano in Sun Valley, Idaho, suddenly comes back to life. Bald Mountain is supposedly extinct, but as the BMXers on the slopes find out, sometimes the geologists are wrong. What is really impressive is how the U.S. Geological Survey in Denver, Colorado, is tracking all these phenomena with a network of devices that quickly locates any rumble of the Earth anywhere and brings up real-time satellite reconnaissance in an instant. It then immediately shows a tactical screen outlining the interior vents and the subsequent pyroclastic flows. I can understand that active volcanoes are wired with sensors and remote cameras, but every mountain in the Rockies? This was a presumed extinct volcano nowhere near any tectonic activity, but they had it wired anyway.

Be that as it may, the extras and bit players are suitably dispatched into the next life. The movie then bogs down with tedious search-and-rescue scenes and much emoting by supporting actors. Back at the USGS, they've decided that the massive California earthquake must have ruptured the North American tectonic plate far inland, creating a new series of volcanic hotspots. With occasional scenes at Sun Valley to pace the movie, the locus of action shifts to Utah, where the superscience satellites have identified another dead volcano as the next eruption site. Monument Valley, also in Utah, suddenly floods as the aquifers are pushed up to the surface.

It turns out there is a mad scientist, or at least a disgruntled one, who predicted all this in his non-bestseller CHAOS THEORY AND SEISMIC ANOMALIES. Dr. Earl Hill was, of course, laughed out of the USGS, but now it appears that he is the man of the hour. He is seen gambling in a Las Vegas casino, just in time for a tremor to shake Sin City, liquify the substrata it sits on, and cause it to be swallowed up by the Earth. The obvious justice of such an event needs no elaboration. Out in the desert, Hoover Dam breaks open and it's goodbye to Yuma.

It finally all comes together with the realization that North America will be split down the middle north-south, re-establishing the ancient sea that existed in Jurassic-Cretaceous times. (The McKenzie River and Missouri-Mississippi River drainage basins are remnants of that ancient sea.) The Great Plains and central Gulf Coast will be flooded unless a miracle occurs.

As each disaster occurs, the movie bogs down more and more with each additional aftermath locale. The one in Las Vegas, where the skyscrapers sink straight down into the sediments, has a plucky band of survivors led by Dr. Hill climbing up to the surface a la the S.S. Poseidon. Fortunately no one starts singing "*There's got to be a morning after / If we can hold on through the night*".

The special effects continue, as the presidential heads splinter and fall off Mount Rushmore. But it is here that the finale begins. A giant rift appears at the foot of the mountain and begins propagating southwards, lava bubbling in its depths and lots of things falling in as it tears its way to the Gulf of Mexico. As it approaches Red Plains, Texas, panic develops because there are two big nuclear reactors sitting in the path. Dr. Earl Hill, having been flown in from Las Vegas after both he and the viewer suffered through interminable rescue scenes, now advises that the rift be diverted by blowing up some natural gas wells in the way. Army choppers arrive on the scene, loaded to the gunwales with C4 explosives, which, under Hill's direction, are packed around the surface valves of the gas wells.

Speaking as someone who has part-ownership in several natural gas wells, I can see why Hill was booted out of the USGS. Blowing the heads off gas wells will make some shallow pits and possibly set the wells on fire, but that will hardly deflect a hundred-metre deep tectonic rift ploughing its way south at breakneck speed. In this alternative world, a few shallow pits do indeed deflect the rift around the reactors. Everyone cheers, but not for long, as the fault continues to the Gulf, takes out Houston, and fills with water when it reaches the sea. The ancient sea is reborn, and the USA and Canada are cut in half.

And so to the end credits, as the American President makes a

stirring speech to encourage everyone that tomorrow is another day. In summary, the special effects were good but the movie was padded out with search-and-rescue scenes. Be prepared to use your fast-forward a lot.

It's The End Of The World As We Know It.

The movie "2012" is a disaster film made in 2009 that did big box office with spectacular special effects. It could be classified under several movie categories such as volcanoes or tsunamis, but I'll sort it here since most of the special effects are earthquake related. The premise of this movie is that the Sun has bombarded the Earth with a new kind of neutrinos that are heating up the planet's core, causing it to expand. This will trigger massive, sudden, and fast tectonic plate movements as they readjust to the new circumference, predicted for December 2012. (And a tip of the hat to the Mayans.)

That premise I am willing to accept as part of the suspension of disbelief one needs for SF, such as faster-than-light drives or transporter beams. What is impossible to believe is that the world governments unite in a secret plan to build gigantic arks high in Tibet to save the selected few, or at least 400,000 of them, and keep it quiet. The conspiracy had to involve a million people at least, yet the general public never learns of it.

That said, the special effects are very well done, and no one should be watching this movie in expectation of well-crafted drama. Not too much time is wasted on setting up the sub-plots and forebodings, and soon we get to the good stuff. It begins with a 10.9 earthquake in California, as all the major faults activate simultaneously and split the state north-south. Lots of good special effects as gigantic rifts open up, plates heave up, and cities slide into the Pacific Ocean. This is soon followed by the Yellowstone supervolcano coming back to life and burying the downwind eastern half of the USA under ash. Las Vegas gets it next, as a giant rift swallows the city.

The movie then takes a break to advance all the subplots before the next round of disasters, mostly tsunamis sweeping the world. The heroes make it to Tibet in time to board one of the arks as the final tsunami, the mother of all tsunamis, stands up and washes over the Himalayas. The survivors find themselves floating in a new world being born. Cue the morning sunlight and orchestral music as they sail off to the Drakensberg mountains of South Africa, where civilization will begin anew. Well done that man with the graphics computer.

It's The End Of Tanganyika As We Know It.

CRACK IN THE WORLD (1964) was seldom if ever seen after its initial theatre release but has recently been released on DVD.

This was a South African-produced movie filmed with arid Spain substituting for Tanganyika. Elderly mad scientist Dr. Steven Sorenson and his 30ish wife Dr. Maggie Sorenson are working on an internationally-funded geothermal scheme called Project Inner Space, to drill into the Earth's molten core and use the magma to generate unlimited electricity too cheap to meter. Steven has two problems: he is terminally ill and racing to get the project completed before he dies, and his assistant is a handsome young buck, Dr. Ted Rampian, who had an affair with Maggie before she married Steven. These May-December weddings are usually trouble. Not without cause, Steven is insanely jealous of Ted.

The plot gets underway with Maggie escorting financial backers of the project around the command centre, located two miles below the surface. Why? Maggie tells the VIPs that since the project is trying to drill to the centre of the Earth, the research staff should be as deep as possible. This makes no sense. The drilling rig is on the surface. The staff observe everything through remote cameras and telemetry, so they could just as easily be at the University of Witwatersrand or an office building in Los Gatos, California. Oil company executives don't have their palatial suites in the Athabasca Tar Sands, military Chiefs of Staff don't build their headquarters in Kandahar, and NASA's Mission Control is not in low orbit.

There's been a problem. For seventeen weeks, the project has stalled at an incredibly hard layer separating the inner core from the outer core. Since the outer core is hot enough to power steam generators, one wonders why they're bothering to use the inner core, but Ted explains that they also want to separate out the metals in the magma. Be that as it may, no available drill bit will cut through the hard layer. Using the well-known engineering principle that if it doesn't work, hit it with a bigger hammer, Steven proposes to use a 10-megatonne thermonuclear bomb to bust through the layer. The warhead will be fired down the borehole with an upside-down missile, which begs the question of why they don't just drop the bomb down the hole. That would save the expense of hundreds of missile technicians, liquid fuel handlers, and gantry builders. No wonder they're over budget.

Ted objects to the bomb on the basis that underground nuclear testing over the years (this was set in 1964, remember) had weakened the Earth's crust. A 10-megatonne detonation directly on the inner core would shatter the crust. In our timeline, underground testing caused localized earthquakes, but the crust as a whole is already riven by trillions of natural cracks and pores, constantly forming and closing up again. Steven disagrees and says the bomb will act like a shaped charge and burn its way through the layer. So away goes the missile to a successful detonation. The command centre shakes a bit, and bits of the walls spall loose. That wouldn't have happened had they been on

the surface but fortunately this was just a minor SFX. The borehole erupts with magma and the scientists erupt with cheering. It's not everyone who can create a manmade volcano. The jubilation over the nuclear shot is brief. Reports of earthquakes start coming in from places hundreds of kilometres away. Is there a connection? Well, if there wasn't, there wouldn't be much left to do in the movie. Ted predicts the next big shock will be off the coast of Shearwater Island. He and a helper descend in a bathysphere and discover magma bubbling out of a giant fissure in the sea floor. The Earth's crust is cracking badly, so that will keep the plot moving along.

Steven is very big about it. He publicly admits he was wrong and Ted was right. Now to face the problem of the crack, slowly spreading around the world. At an emergency briefing, Ted tells the dignitaries that the crack is spreading across the Indian Ocean, will cut Australia in half, then go across the Pacific Ocean to San Francisco Bay. From there it will dissect the USA as it returns across Africa to its origin. The steam generated by oceans flowing into the molten crack will, according to Ted, generate colossal pressures that will rip the planet apart and destroy it. Granted that I've forgotten most of my university physics but I doubt that scenario. The steam would not be confined under pressure in the crack but would billow out of it. This would shroud the planet and create an ecological catastrophe but certainly not shatter the Earth into a new asteroid belt.

The underwater crack continues to pump out magma, and we see lots of stock shots of Hawaiian lava flows, mixed in with vignettes of otters, racoons, and squirrels fleeing a forest fire. This is all very baffling because the crack hasn't yet passed the tip of India out in the ocean. We know that for a fact because Ted comes up with a plan to stop the crack at a volcanic island southwest of India. He remembered his basic engineering on how to stop a crack from spreading further; you drill a hole at the end of the crack to relieve the pressure. Ted proposes to start up a dormant volcano by hand-lowering an atomic bomb into the crater. Nukes: can't live with them, can't live without them. The detonation will blow a hole ahead of the crack and stop it.

The thing is done. We see a stock shot of the Bikini Atoll atomic blast, which even then was a cliché in movies. The good news is that the crack is not going to make it past India. The bad news is that it has turned about and is heading back to Tanganyika, faster than before. The circular path of the crack will end where it began, at the project borehole. Ted tells us that this will create a 20,000 square mile plug that will be blown out into space from the pressure of the core's magma, giving Earth a second moon. This isn't believable because the Earth doesn't have that much pressure bottled up inside of it to blow a 200 mile by 100 mile chunk of Tanganyika out into space. Ted and Maggie race back into the centre of the hazard. Along the way, they see a passenger train loaded with panicky extras heading straight for the crack. They

try to stop it and fail. The SFX of the train disaster are well done, although Maggie's emoting at the sight of all those extras suddenly departing this life is overblown. The couple race to the command centre, which is crumbling from the earthquakes. If you've ever seen a James Bond film where the supervillain's headquarters is collapsing as his superscience machine explodes because he forgot to build in circuit breakers, then you've seen this sequence. Steven is there but he won't leave, given as how his illness will kill him just as fast as any crack in the world. He gives Ted and Maggie his blessing and they run for safety. They make it just past the crack when the plug blows, and 20,000 square miles of Tanganyika soars up through the atmosphere.

One would think that such a massive chunk of rock with a molten underside passing by them with only a few metres to spare would carbonize them from the radiant heat but no. They get to see the underside of the molten plug as it becomes earth's second moon. The SFX at this point are very well done and match anything done today. The final shot is of the couple gazing up at the sky as the orchestra swings into action. One would also think that the big hole in the ground where Tanganyika used to be would be filled by magma surging in from down below, creating a supervolcano and burying Ted and Maggie under lava. But no, the pit just steams a bit as the orchestra cues up the music and the end credits roll. All's well that ends well.

HUMAN EVOLUTION: PART 1. IN THE BEGINNING

by Dale Speirs

The origins of ourselves have always fascinated us. Hominids are ape-men and humans, of which we are the only surviving sapient species. Apes such as orangutans and chimpanzees are clever and somewhat intelligent, but are obviously not in the same category as *Homo sapiens*. Humans and orangutans evolved from a common ancestor which in turn evolved from another ancestor that also produced the other African apes [59]. The human/orangutan ancestor is dated at 13 megayears before present and was spread out between Africa and southeast Asia. The intermediate populations later became extinct, leaving the genus *Homo* at the western end of the distribution and orangutans at the east end with nothing in between. *Homo* then evolved several species, of which ours is the sole survivor of the genus.

The fossil evidence shows that the origin of humans was in eastern Africa, and recent advances in genetics confirms this [76]. DNA analysis shows that humans have trends in genetic variation throughout the world. These trends follow a systematic basis that can only be explained by a multiple radiation out of Africa. Attempting to use any other geographic area as the origin of humans results in contradictory gene flows that don't make sense. The genetic differentiation between populations of humans (excluding those descended from more recent migrants) shows a

linear relationship between Africa and the rest of the world. An analogy would be a fan spreading out from Africa; all the gene flows can be traced back to Africa, but not between each of the tines of the fan. -12-

Evolution is not a ladder where one species evolves into the next in strict linear order but more like a shrub, where numerous branches arise from the base. Some branches remain unchanged, some die out, and some are different than the others. When two species first evolve, they may still be close enough to exchange genes and hybridize. As an example, one study shows that a particular gene responsible for brain size first evolved in a line of hominids separate from modern humans about 1.1 megayears ago which developed into Neanderthals, then cross-bred into humans about 37,000 years ago [57].

The successful genus of hominids proved to be *Homo*, a generalist species not adapted to any one specific habitat. Humans are among the physically weakest large animals. We have a poor sense of smell, many species of animals have far superior vision, and we cannot survive most of the climates we live in without shelter and clothing. Yet we prevail over all other large animals because our brains evolved language, foresight, and social co-operation far beyond any other species. Humans have another advantage over competitors (other large animals) in that while we are poor sprinters, we are the best endurance runners [47].

Humans have about 40,000 retrovirus DNA sequences in our genes, which were probably infected into primate ancestors about 40 to 10 megayears ago. These have long since ceased to be malicious, just as millennia from now our descendants will be immune to influenza or HIV. It has been suggested that some of these retrovirus sequences may have jump-started human evolution by providing unusual genetic recombinations [64].

Who's Afraid Of Global Warming? It Made Us What We Are.

Palaeontological records show numerous changes in ecosystems over the last four billion years, one of which, the extinction of dinosaurs, was indirectly responsible for the evolution of humans. When a change is triggered in an ecosystem, the chaos effect may send it in any direction. The ecosystem may hardly be affected by the change, or it may collapse completely and wipe out most of the species associated with it. Mass extinctions do not just affect specialized or declining species. They can wipe out widespread species that are apparently at the height of their success [9].

Historically there was doubt among palaeontologists as to the speed at which an ecosystem collapse or climatic change occurs. It was long thought that changes would be gradual and noticeable in advance. Modern research has shown this is not the case. Studies of the fossil record show that climatic systems can be very

sensitive to small changes in variables such as atmospheric transparency, glaciation, and gases [8]. Research in northern New Mexico showed that a drought in the middle 1950s shifted the boundary between a ponderosa pine forest and a pinon-juniper woodland more than 2 km in less than five years. Furthermore, the ponderosa had still not recovered its previous ground 45 years after the drought ended, and soil erosion had greatly accelerated [7]. There are numerous other examples of this type.

The climate changes that affected human evolution were not localized. Glaciation in the northern hemisphere took water out of the oceans and air, and sea levels fell around the world. The Grand Banks of Newfoundland were dry land, and the English Channel was a deep valley. The geological record shows three major climate changes as the glaciers advanced and receded, each of which is correlated with hominid and human evolution [90]. Geological core samples correlate climatic changes with hominid species extinction, but not with species origin. Other factors therefore affect the origin of new species, while climatic changes determine which become extinct [2].

About 2.5 megayears ago, in the Pliocene age, African climatic changes began to shift habitats from moist woodlands to dry, open savanna. A period of variable climate followed, and coincided with the evolution of *Homo* and changes in the fauna of the region [40].

Australopithecus hominids lived in well-watered woodlands, while *Paranthropus* lived in both woodlands and open areas but always with nearby wetlands. *Homo* lived in dry grasslands. About 2 megayears ago, climate dried out and shifted habitats to open savannas, thus favouring *Homo* at the expense of other hominids [1]. There was not one single episode of drying out of the land but several, and each fluctuation caused turnovers in the flora and fauna of eastern Africa [46]. Hominids were thus selected for several times, and ultimately the most successful was the genus that could adapt to changing environments as a generalist rather than a specialist.

[to be continued]

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ZINE STATISTICS FOR THE YEAR ENDED 2012-12-31

by Dale Speirs

As in previous years, I kept count of the zines I received, and as per the trend, the number slowly continues to decline. Page counts seem to be on a plateau. I leave it to someone else to analyze the number of pdf zines (new issues, not scanned back issues) appearing on the World Wide Web.

# of pages		
Year	eAPA	FAPA
1997		1,348
1998		1,454
1999		1,540
2000		1,463
2001		1,266
2002		1,389
2003		1,273
2004	n.a.	1,903
2005	424	1,065
2006	722	1,287
2007	494	1,019
2008	448	1,088
2009	497	1,011
2010	414	1,011
2011	348	1,062
2012	456	1,007

Year	Australia	Canada	Britain	USA	Others	FAPA	Other apas	Totals
1998	23	31	39	244	7	155	10	509
1999	14	51	67	213	19	150	125	639
2000	7	55	55	161	29	140	90	537
2001	9	42	35	172	25	132	68	483
2002	10	40	42	184	31	102	42	451
2003	4	72	27	171	26	111	34	445
2004	1	33	19	172	34	135	53	447
2005	8	34	14	148	27	116	dropped	347
2006	5	10	32	130	18	120	all other	315
2007	5	32	12	139	10	105	apas	303
2008	5	28	10	136	7	115		301
2009	5	31	8	143	5	105		297
2010	6	26	5	138	8	98		281
2011	16	33	7	127	4	92		279
2012	8	35	7	85	4	103		242