

Comets , Asteroids And Future Cosmological Catastrophes

Last Updated
Feb 1998

Asteroids and Comets In The Last Days

Compiled By Glen W, Chapman

Dr. Frank Close. t Apocalypse When

Comets

“On 30 August 1979 a satellite orbiting the earth recorded a catastrophic event. The Sun's gravity had ensnared Comet 'Howard-Koomen-Michels 1979XT', which fell headlong into the stellar furnace. Within a matter of seconds the comet, larger than the Earth, was destroyed. The immense power of the Sun vaporized the comet as an elephant destroys an ant. The debris scattered for millions of miles in the Sun's atmosphere.

The comet's head is deep frozen when far from the Sun where the ambient temperature is -270 degrees Centigrade. The ice contains deep-frozen ammonia, methane and balls of gravel.

As comets approach the Sun, its warmth vaporizes the ice. The ejected gas and dust reflect sunlight and appear from the Earth as a bright head, or coma. The comet's nucleus consists of one or two lumps of rock of about a mile diameter. The coma is usually bigger than the Earth and may be as much as 100,000 miles across. The melting ice releases the stony pieces with the result that the comet eventually becomes a mile-sized ball of gravel weighing over a million billion tons. Large though this sounds, it is trifling on the scale of the Earth and other heavenly bodies. As far as we know, comets have never perturbed the motions of the planets or even their moons. In 1770 and again in 1886 comets passed between the moons of Jupiter without noticeably affecting the moons' motions even though the comets' trajectories were significantly deflected. So a near miss will not affect the course of the Earth; it will take more than a comet to send us headlong into the Sun or flip us out into deep space. A direct hit is a more serious matter. Comets are moving at several miles per second, as is the Earth, and a direct hit from a mile-sized lump of rock can't be ignored. The Arizona and Tunguska impacts involved objects 'only' 100 metres across. There are huge rings around the Sun. When the Earth passes through one of these we experience a meteor shower as the dust burns up in our atmosphere. Some of the larger pieces reach ground as meteorites. The largest pieces may orbit on long after the rest have dispersed or been burned up in collisions. These extinct comet heads form some of the asteroids.

The largest asteroids are as big as countries. Ceres spans France and Belgium. Pallas and Vesta are as big as Southern Scandinavia and Juno is the size of Ireland. None of these comes anywhere near our orbit to threaten us, but many much smaller asteroids actually cross the Earth's orbit. These mavericks are called 'Apollo Objects' after the half-mile diameter asteroid Apollo, which was discovered when it approached near to the Earth in 1932.

Apollo Objects

Recent searches for Earth-crossing asteroids suggest that they could be numerous. None of them is larger than a few miles in diameter but a collision would wreak havoc for hundreds of miles and the disturbance of the atmosphere would cause great storms at least. The first hints of such an awful possibility emerged in 1898 with the discovery of Eros an asteroid that comes within Mars's orbit. In this century we have on several occasions come within days or even hours of hitting an asteroid. The future is not likely to be any different. Every few years one or other of the Earth-crossing Apollo objects will come within hours of hitting us. In time it is certain that we and one of them will score a bull's-eye.

Meteors

The Apollo objects are outnumbered by the debris of smaller comets which cause the annual meteor showers. We pass through the debris and then voyage around the Sun for a whole year until we come back to the same relative position and pass through the ring again. Although the ring as a whole appears stationary, it is in fact in permanent motion. It consists of pieces of gravel and dust that are themselves orbiting the Sun. One piece of stone rushes past, pursued by another, and another, so that there is a continuous stream of pieces all the time.

Most of the individual pieces of dust in the stream of meteors weigh only a few grams, but the head of a comet might be lurking, several miles across - an Apollo asteroid in the making. Very likely there are many large lumps of rock that could hit and leave a big mark. If so, each year the Earth is crossing a lethal freeway whose traffic travels at 30 miles per second, most of which are gnats but one or two could be boulders the size of mountains.

Compiled By
Glen W. Chapman
Chapman Research Group

This is like playing chicken on the roundabout. The Earth is going round and round, missing the big head this time, last time, until eventually the odds run out and we collide. If a comet has been utterly destroyed then its debris may be distributed uniformly around its entire orbit. We see a meteor display on the same nights each year as we pass through; the intensity is the same from one year to the next. However, if the comet is still around, or only partially decomposed, the density of the debris may vary considerably, being large in the vicinity of the head and negligible far away. In this case the meteor showers will have dramatic peaks in certain years when we pass near to the head while being disappointing in intervening years.

There are a few major meteor streams each year. These include the Leonids (12 November), the Perseids (mid-August), the Beta Taurids (peaking on 29 June) and the Geminids (14 December). Let's look at them in turn.

On average there are about ten meteors per hour when the Leonid shower occurs each November. There is a wood-cut in the American Museum of Natural History showing hundreds of trails in a Leonid shower. Even allowing for artistic license this is excessive, but there must have been a spectacular shower to impress the artist.

It was the great meteor shower of 12 November 1833 that really started serious study of meteors. Hundreds of thousands were seen all over the eastern coast of North America. All of them seemed to radiate from a point in the constellation Leo - hence Leonid'.

What does 1999 portend?

In some interpretations of the prophecies of Nostradamus the Apocalypse will occur in that very year. Moreover, a comet will herald it. appearing around 21 June. So the year looks promising,"

Scientists hypothesize that such an impact killed the dinosaurs Dr Richard Muller in his book title the Nemesis The Death Star describes such an event:

"At the end of the Cretaceous period. the golden age of dinosaurs, an asteroid or comet about 5 miles in diameter (about the size of Mt. Everest) headed directly toward the Earth with a velocity of about 20 miles per second, more than 10 times faster than our fastest bullets. Many such large objects may have come close to the Earth, but this was the one that finally hit. It hardly noticed the air as it plunged through the atmosphere in a fraction of a second, momentarily leaving a trail of vacuum behind it. It hit the Earth with such force that it and the rock near it were suddenly heated to a temperature of over a million degrees Celsius, several hundred times hotter than the surface of the sun. Asteroid, rock, and water (if it hit in the ocean) were instantly vaporized. The energy released was greater than that of 100 million megatons of TNT, 100 teratons, more than 10,000 times greater than the total U.S. and Soviet nuclear arsenals.

Before a minute had passed. the expanding crater was 60 miles across and 20 miles deep. (It would soon grow even larger.) Hot vaporized material from the impact had already blasted its way out through most of the atmosphere to an altitude of 15 miles. Material that a moment earlier had been glowing plasma was beginning to cool and condense into dust and rock that would be spread worldwide. The entire Earth recoiled from the impact, but only a few hundred feet" The length of the year changed by a few hundredths of a second.

The deep crater may have reached through the crust of the Earth to the mantle. The rock at this depth is very hot due to the natural radioactivity of trace amounts of potassium, uranium, and thorium. The hot rock had turned to liquid as soon as the weight of the rock above it was removed. Great pressure from the Earth's interior quickly filled in most of the crater with melted rock from below. It is possible that molten rock continued to flow in a great outpouring.

Shock waves from the impact rattled the Earth with energy much greater than that of the largest earthquakes humans have experienced, probably a million times more energetic than the one that devastated San Francisco in 1906. The shock may have triggered other earthquakes, causing aftershocks lasting for months or years. This is speculation, for we don't know enough about the crust of the Earth to say with any certainty. Weak points in the Earth's crust may have opened and sprouted new volcanoes. It is impossible to guess all the effects, or how long they lasted.

The asteroid quickly punched through the water layer much as a rock would through a puddle, since in most places the depth of the ocean is less than the hypothesized 5-mile diameter of the asteroid. The splash created a great tsunami, or tidal wave, which grew hundreds of feet high as it swept toward shore. The giant wave circled the Earth many times, inundating the coastal regions. Only the interiors of the continents were spared. Rock from the crater, mixed with vaporized comet material, cooled to several thousand degrees Celsius as it rose in a fireball up through the atmosphere. It was then about as hot and bright as the surface of the sun. Some of the material ejected from the crater flew out of the atmosphere in ballistic trajectories and, like ICBMs (intercontinental ballistic missiles), rained havoc on distant continents. Some escaped into space, perhaps to hit the Earth on an anniversary of the impact when both

the Earth and the ejecta returned to the same part of their orbits around the sun. As the fireball reached the top of the atmosphere, it bobbed like a cork, floating on the cooler air beneath it, but it had nothing to hold it together and it began to spread out over the entire globe. As it spread, its color cooled from a glowing red to an impenetrable black. The surviving creatures below probably thought that night had come early, but it was a night without a moon, without stars. The dinosaurs could not see the own claws in front of their faces. Morning would not come for several months.

A few animals had avoided the initial destruction, and at first they seemed to manage surprisingly well. Most of the plant eaters could still find food, although the settling dust added a gritty texture to it all. Some of the carnivores were accustomed to hunting in the dark, although they had never experienced blackness such as this. But the ultimate source all food, the sun, had been effectively blocked out. Without sunlight, there was no photosynthesis. no creation of sugar and starch from carbon dioxide and water. Unseen by the animals, the plants were turning from green to yellow. and then to brown.

Without sunlight, the temperature of much of the Earth began to drop. On much of the land the temperature soon fell below freezing. On those fortunate few animals that had already begun to hibernate didn't notice. Warm-blooded creatures had an advantage in their ability to endure the cold, but they also required more food. The coastal regions had temperatures moderated by the oceans, but these were the areas that had been devastated by the tsunami. Tremendous storms were generated by the great temperature differences between the oceans and the land masses. The storms rained the nitrous and sulfuric acids onto land and sea. The tiny particles of dust high in the atmosphere began to stick to each other, agglomerating into larger particles, which fell to Earth more quickly. All over the Earth the dust settled to form a layer about a half inch thick.

As the dust settled, sunlight began to filter through to the Earth's surface. Virtually every animal and plant had died. The plants were probably the first to revive. Many spores and seeds had been left behind. Life is incredibly robust. For some plants, the three-month period of darkness and cold was no worse than a severe winter; these resprouted from seeds and roots. It was a miracle that any of the higher life forms made it through. Indeed, almost every land animal that weighed more than about 50 pounds had been extinguished, probably because they were most vulnerable in their high position on the food chain. The reptilian dinosaurs, both on land and in the sea, had vanished forever."

Daniel Cohen former editor with Science Digest in his book Waiting for the Apocalypse concludes: "Amid all the controversy, this much we can be certain of; large meteorites have struck the earth in the past, causing considerable damage, and large meteorites will continue to strike the earth from time to time in the future as long as the earth exists.

Are there meteorites out in space that are large enough to cause a worldwide cataclysm if they struck earth? And if so, do such objects regularly enter the vicinity of the earth? , The answer to both of these questions unfortunately is yes. The objects are the "male" asteroids. There are two pnncipal theories regarding the asteroid belt. The first is that the asteroids are the remains of a planet that at one time or another broke up. Just how this planet might have broken up is unknown. The planet could have been shattered by a head-on collision with another body of about the same mass...

Still even the possibility that a planet in the solar system was broken up by an unknown catastrophe should make us a little uncomfortable about the safety of our own planet. If it happened once, it could happen again. But the asteroid belt does not merely serve as a warning that a planet might be destroyed; the asteroids themselves can present a real danger to the earth.

A few large asteroids have broken out of the belt and become wanderers through the solar system. All of these asteroids have been given masculine names (usually the names of Greek gods and heroes) and are referred to collectively as the male asteroids. The male asteroids do not really wander. They too orbit the sun, but their orbits cut across the orbits of other planets, including the orbit of earth. And some of these asteroids can come pretty close to the earth...An asteroid hitting the ocean would create a tsunami (tidal wave) of such monstrous size that it would probably swamp all the islands and low-lying coastal areas on the ocean's rim...

Icarus and the rest and even Eros with its fifteen-mile diameter are still fairly small asteroids. We know that much larger asteroids orbit in the asteroid belt, and we can not be entirely sure that larger ones do not also cut through the orbits of other planets, including earth. None have been detected so far but, as we pointed out, they are hard to detect. Nor do we have the faintest idea what pushes an asteroid out of the belt and sets it careening through the solar system.

What would happen if something really big, a hundred miles across or more, struck the earth? How big a crater would such an object make? It would dig a crater about the size of the Pacific Ocean."

Astronomers Clark R. Chapman and David Morrison in their 1989 book titled Cosmic Catastrophes conclude: "The threat of cosmic scale catastrophes remains very immediate. Indeed, civilization as we know it could be changed or even doomed within the lifetimes of our grandchildren by

collision of the Earth with a comet...Comets, which are composed of both rock and ice and which can appear from the depths of space at any time, are also capable of striking the Earth. The consequences of such events in the past history of our planet are only now becoming apparent, and we have hardly begun to think of the damage they could inflict in the future. ..

At the boundary between rocks of the older Cretaceous and newer Tertiary periods of geological history, more than half of the total species on our planet became extinct. There is now clear evidence that this discontinuity was caused by the collision of an asteroid or comet with the Earth. The pulverized remains of this celestial interloper, together with millions of tons of terrestrial rock dust resulting from the impact, can be found today in a layer of clay deposited all over the globe at the boundary between the rocks of the Cretaceous and Tertiary periods.

When the mass of iron in a meteor or asteroid strikes, it is moving so fast that it penetrates to a depth equal to twice its diameter within just over 0.01 second. This is all the time that is required to stop its forward motion. In this instant, the energy is released, turning the projectile and a part of the surrounding rock into a superheated fireball of incandescent vapor. Shock waves shatter the ground below the impact, and the blast pulverizes the surrounding rock and ejects it in an expanding cloud of debris. When the dust clears, a new crater is revealed, about 20 times the diameter of the original impacting mass of iron...

During the past 20 years, as geologists have learned to identify the unique minerals and highly shocked rock fragments that are the indicators of violent explosions, these cryptovolcanic structures have become the subject of renewed research. One by one, they have revealed evidence of catastrophic formation, not the slow action of volcanic pressure. Today, most geologists are convinced that these cryptovolcanic structures are products of meteoritic impacts.

Today more than a hundred ancient craters have been located, with diameters as great as 50 miles. The old, nearly healed scars of past impacts are thus being brought slowly to light.

One of the best documented of these larger impacts formed the Ries Crater in the southern plains of Bavaria. The projectile in this case was a rocky asteroid with a diameter of nearly a mile and a mass of more than a billion tons—an Earth-approaching asteroid equivalent to the smallest such objects discovered today by astronomers. At a speed of 10 miles/sec, this projectile would have had an energy of several million megatons, far larger than all of the most horrible human weapons of mass destruction put together. The force of the explosion when it struck Europe is almost beyond imagining, although there have been earlier impacts that dwarf even this one...Around the basin rim are broken and upended rock strata, and huge boulders are found in the surrounding countryside to distances of 35 miles or more. Also present are the high-pressure minerals and shocked rocks that geologists recognize as the mark of an impact explosion site. Originally, the Ries Crater must have been at least 3 miles deep, and the mass of material removed from the cavity was more than a trillion tons. As the mile-wide asteroid plunged through the atmosphere, it opened a cylindrical vacuum behind it, permitting some of the debris from the explosion to spray back into space. Millions of tons of this debris spread out through this hole in the atmosphere and then reentered at high speed, where friction molded the fragments into teardrop-shaped lumps of glass, typically an inch or less in size. These strange solidified droplets, called "tektites," are found today scattered over much of Central Europe. A dozen or so other tektite fields have been recognized around the world, each apparently corresponding to the melted debris from a very large impact. Let us try to reconstruct the effects of the Ries Crater explosion. The blast wave would have destroyed all life to a radius of hundreds of miles, while the earthquake shock must have been felt around the world. Of the trillion tons of material blasted from the crater, perhaps a billion tons of fine dust remained suspended in the atmosphere, darkening the sky all around the globe. We do not know how long this dust pall remained, or what effect it might have had on the world's ecology. If it were thick enough, it could have had long-term influence on the climate even triggering an ice age.

A thousand mountain-sized objects flying around in space, each capable of colliding with the Earth at 10 miles per second, might seem to be a terrifying threat. There is the possibility that one of the many hundreds of Earth-crossers not yet discovered may cause Armageddon at any time...If a small comet or asteroid should strike the Earth tomorrow, the damage could be very great. Such an impact in a heavily populated urban region would kill millions of people, dwarfing the effects of the Hiroshima and Nagasaki atom bomb. But what of still larger projectiles? At what point would the catastrophe become truly global, regardless of the exact point of impact? Our planet is a big place, but worldwide catastrophes caused by collisions are by no means impossible.

Consider the effects of a collision with an asteroid or comet having hundreds of times the mass of the Ries Crater projectile discussed earlier. Such a projectile, with a diameter of about 10 kilometers (6 miles), A trillion tons of material streaking toward the Earth contains a prodigious quantity of energy, equivalent to 100 million megatons—the explosive power of 5 billion atom bombs of the Hiroshima type. The resulting crater would be over 100 miles across; its initial depth might be sufficient to blast through the

crust and penetrate into the upper mantle of the Earth. Calculations show that about 100 trillion tons of pulverized rock would be lofted into the atmosphere, consisting of the material of the impacting body mixed with a much greater quantity of rock dust from the terrestrial crust. If the impact occurred in the ocean, towering tidal waves would spread out over much of the planet, and additional trillions of tons of water would be vaporized.

The explosion produced by such a large impact would itself be damaging, but even more important would be the consequences of lofting 100 trillion tons of dust into the atmosphere. Scientists have calculated that this quantity of dust would have produced a pall over the whole globe with a duration of at least several months. During this period of global darkness, neither light nor heat was available to sustain life. With photosynthesis at a standstill and the Earth plunged into deep cold, it is no wonder there was a great dying..”

Drs. Victor Clube and Bill Napier Astronomers at the Royal Observatory Edinburgh have studied the effect of large comets hitting the earth in their book The Cosmic Serpent.

They state that a one mile meteor or asteroid would be equivalent to 20 million megatons of TNT which would generate sudden winds of 200 miles an hour at a radius of 2500 miles and 140 deg. F blast wave temperature. They estimate that 90 % of all trees at this range would be destroyed and the remainder would be denuded of branches. It would trigger cataclysms and earth quakes and cause vast famines. In the sea would be a collapse of the food chain and death of fish and sea life causing a stinking sea ,cyanide poisoning and intense shock dissociation of compounds and would produce an intolerably cold winter due to the ash blown into the jet stream blocking out the sun's radiation

In their 1990 book titled The Cosmic Winter they go into more effects of such a collision and the resulting cosmic winter They state:

“An unrecognized hazard is out there; and at a stroke, civilization could be plunged into a new Dark Age...

In June 793, 'fierce foreboding omens came over the land and wretchedly terrified the people', signs that are said to have been followed by great famine. On 25 June the Moon, more or less in line with the Earth, was apparently struck by a missile whose energy was ten times that of the combined nuclear arsenals of the world. On 30 June 1908, an object from space exploded above a remote area of Siberia with the energy of a large hydrogen bomb. More recently, during five days in late June 1975 an unexpected swarm of boulders the size of motor cars struck the Moon at a speed of 67,000 miles an hour. And then again, on 30 June 1994, there came an unheralded explosion with the strength of a 20-megaton bomb....

Within these last few years, it has been found that there is a great swarm of cosmic debris circulating in a potentially dangerous orbit, exactly intersecting the Earth's orbit in June (and November) every few thousand years. More surprisingly, perhaps, it has been found that the evidence for these facts was in the past deliberately concealed. When the orbits exactly intersect however, there is a greatly increased chance of penetrating the core of the swarm, a correspondingly enhanced flow of fireballs reaching the Earth, and a greatly raised perception that the end of the world is nigh.

The largest known asteroid currently in an Earth-crossing orbit is Hephaisstos. It was discovered only in 1978, which gives an indication of the difficulty of finding these objects, whose diameters are only a few kilometres and whose surfaces may be as black as soot. We have seen that this object is ten kilometres in diameter and is in an orbit very like that of the Taurids, but rotated through about 90 degrees. Probably some thousands of years ago, it split from the giant comet whose debris now circulate along the Taurid track. Hephaisstos is a potential collision hazard, although not immediately so. It would strike the Earth at just over 30 kilometres/second, with an impact energy of about 100 million megatons, that is, equivalent to the simultaneous unleashing of about ten thousand full-scale nuclear wars. What would happen?

If Hephaisstos struck the ocean it would within seconds generate a cavity in the ocean water and underlying bed about 40 kilometres wide. It would penetrate the crust to a depth of perhaps 20 kilometres, exposing the underlying hot mantle. A column of water, steam, rocks and dust many kilometres high would be hurled into the air, and waves about 5 kilometres high would rise around the impact site. These would drop to a few hundred metres amplitude at 1,000-2,000 kilometres distance but on entering a continental shelf or shallow seas would rear up again into a tsunami several miles high, overturn, and generate intense and prolonged turbulence.

The reefs of the world are found in shallow ocean water, generally less than two hundred feet down. Most of a reef comprises a fine, sandy material loosely bound by the creatures and plants anchored to the underlying limestone framework of coral skeletons. The effect of sudden, violent and prolonged turbulence generated in the seas by a giant impact would be to uproot and disperse the living part of the reef and choke the filter-feeding creatures near the base of the food chain. In addition plankton would suffer through the thick pall of stratospheric dust which would float down through the air and greatly

reduce sunlight for at least a few months; if photosynthesis came to a halt, there would be wholesale collapse of food chains. Many modern plankton are already living at the limit of their tolerance of ultraviolet light. Above the atmosphere, ultraviolet light is of lethal intensity. Most of this radiation never reaches the ground, being absorbed by a layer of ozone in the stratosphere. But the creation of nitrous oxides in the fireball would react with the ozone high in the atmosphere, so that when the dust finally settled there would be an ultraviolet deluge and this would itself cause sweeping extinctions. Oceanic ecological systems are complex, particularly reef systems. Because of the lack of seasonal change they are subjected to very little stress and are therefore not adapted to cope with a major upset in the environment. They depend on an abundance of sunlight, which filters down through the water, creating a delicate, stratified system of organisms adapted to the light available at each level. Severe turbulence, lack of sunlight, or high ultraviolet dosage are each lethal to a reef community; and yet these are precisely the consequences of a large impact. It seems that a colliding Hephaistos would wipe out the plankton and reefbuilding communities worldwide. Presumably, with the base of the food chain undercut, there would be a domino effect throughout the marine kingdom....

If Hephaistos were to strike land, a crater perhaps 200 kilometres across would be gouged out within a few minutes, with rims several kilometres high. The basin would flood with lava. An impact in India would flatten forests in Europe, setting them ablaze. Debris thrown out of the crater would range from mountain-sized lumps, themselves formidable missiles, to hot ash, thrown worldwide and adding to the incineration below. Earthquakes would be felt globally and would everywhere be at the top end of intensity scales, with vertical waves many metres high and horizontal ones (e.g. push-and-pull waves) of similar amplitude. These waves would run around the Earth for some hours and would presumably create great devastation. Land creatures would of course suffer also from the cutting out of sunlight for months in equatorial regions and possibly one to three years in polar ones...

Swarms such as the lunar one may exist for only a few centuries before they disperse along the orbit and it is likely that there exists, within the Taurid stream, an undiscovered asteroid in process of breaking up. It could be up to 30 kilometres across and still have escaped detection. It could also be the prime hazard facing civilization.

In summary, there are many factors which make it likely that devastating impacts are bunched into brief periods of high risk interspersed with longer quiet periods. Tunguska-sized impacts must follow the galactic trend of the large crater-forming ones, so creating periods of high and low risk depending on the galactic environment; within an impact episode the risk is higher if there is a giant comet around, and higher again on those occasions when its orbit intersects that of the Earth; and if large boulders do form in swarms, then during close encounters with the comet or its degassed remnant there is a risk of occasional bombardment on a scale comparable with that of a nuclear war....

In 1977, the American astronomer Kowal discovered a faint object which, although it left a short asteroid-like trail on a photographic plate, it did not lie in the asteroid belt. Kowal's object which later turned out to be Chiron a huge comet in a chaotic, unstable orbit between Saturn and Uranus. Analysis of the orbit shows that the comet passes close to these planets from time to time, having had a close encounter with Saturn in the seventeenth century. During such strong encounters the course of the comet cannot be predicted with accuracy and its orbital history is not well known. When the comet is eventually expelled from this zone, there is a 20 percent probability that it will be thrown into interstellar space, and an 80 per cent probability that it will be thrown into the region of the inner planets..

Thus there are only about a dozen asteroids larger than Chiron...Such an enormous body, disintegrating into dust and , asteroids over some thousands of years, would be an awesome sight. But also, it could hardly fail to create a severe climatic trauma probably an ice age and a great mass extinction of life would then be unavoidable. It is probably rather fortuitous that Chiron has gone undiscovered for as long as it has, and there are probably not too many Chiron-sized objects waiting in the wings, but a very large population of smaller bodies could well exist, undetected, in the Saturn-Uranus region. Because of our complete ignorance of the size of this population, the hazard is hard to assess...

Consider the following sequence of events: suppose, first, that the freezing after an impact is such that large areas of the planet remain snow-covered throughout a summer. With the onset of winter, this snow cover thickens. By the following summer, with dust still suspended in the stratosphere in middle and high latitudes, the snow is too thick to melt; in the following winter it is added to and so on. When, eventually, the dust clears, the land masses of the northern hemisphere are covered in a snowfield which, reflecting sunlight back into space, has become permanent. The snowfield is added to each year until, within a millennium or two, Europe and North America are again covered in ice sheets a kilometre thick, the ocean level has dropped by 50 or 100 metres, and the Earth is locked into a new ice age. Quite a small lowering of temperature, say about 2° or 3° C for some years, would at the present day be enough to cover much of northern Canada, especially Baffin Island (over 1000 miles long), with permanent snow. This in

turn would create a cold trough, triggering further cooling and snow over Quebec province to the south (which is largely a high plateau), leading down to the region of New York and the Great Lakes. Once such a feedback got going, it is difficult to see what could stop it.”

Close Calls.

“According to Arthur Humphrey, immediate past president of the American Institute of Chemical Engineers, the Earth has just missed several catastrophic collisions with asteroids in the last couple of years. He said that in January 1991 Asteroid 1991 BA, which is 10 meters in diameter, missed the Earth by 170,000 miles. This means that it and the Earth would be in the same place within less than 24 hours! In March 1989 Asteroid 1989, which is 400 meters in diameter, passed within 682,000 miles of Earth. Humphrey estimates that there are about 11,000 asteroids larger than 5 kilometers in diameter that cross our orbit. Humphrey suggests that scientists map all the asteroids that cross Earth orbit, giving us a chance to divert any that might threaten the Earth. “

Chemical and Engineering News, February 3, 1992.

November was a good month for doom mongers

“Newspapers were filled with news that a comet could wipe us all out in the year 2126. The newly rediscovered comet Swift-Tuttle crossed Earth's orbit on December 4, 1992. At the time, the Earth was safely millions of miles away. Such may not be the case in 2126, according to experts. At that time the Earth and Swift-Tuttle may occupy the same point in space only 15 days apart. Two problems complicate this picture. The precise orbit of Swift-Tuttle is not known. And it is suspected that gravitational influences could delay the comet enough to bring it closer to Earth. The impact of the comet could equal 100 million megaton nuclear bombs.” The Beacon Journal 10/18/92

Dr. Duncan Steel, a research astronomer at the Anglo-Australian Observatory, in his 1995 book Rogue Asteroids and Doomsday Comets Tells of some of the most recent findings. He writes:

“It is difficult to overstate the almost unimaginable energy that is released when a massive asteroid or comet hits the Earth. Merely stating that the explosive power is far greater than all the world's nuclear arsenals combined does not properly convey matters. The reader may think that such combined power might simply result in a larger area being flattened than that which a nuclear bomb devastates. Instead of the holocaust wreaked in the few square kilometers of central Hiroshima, for example, we might imagine all the buildings in the metropolis of Los Angeles being toppled. In fact, the impact of a large asteroid or comet is quite different from that. Were one to land in Southern California, for example, all of Los Angeles along with several kilometers of the rock from the Earth's crust beneath it would be picked up and largely vaporized, lumps raining down on Hawaii and New York an hour or so later. Not that Honolulu or New York City would be left standing by then. Phenomenal seismic shocks following the impact would have already shaken them flat...A 1 kilometer asteroid impact could cause the death of at least 25% of humankind...”

Over the past few years, there has been mounting evidence that some, if not all, comets evolve into asteroids, and thus some Earth-crossing asteroids may originally have been comets. There are some astronomers who believe that the majority of such asteroids are extinct or dormant comets...At the time of this writing, 160 or so Earth-crossing asteroids are known, although many have poorly determined orbits and have been lost again. Of these, about half are more than 1 kilometer across...according to best estimates, about 15% of the total population of the Earth-crossing asteroids down to 2 to 4 kilometers in size is known, and about 7% of the 1- to 2-kilometer bodies. Using these percentages, one can arrive at an estimate of about 2,000 Earth-crossing asteroids larger than the minimal global catastrophe threshold, a diameter of 1 kilometer. The following being the estimated populations of smaller Earth crossers:

Larger than 1 kilometer: 2,000 (maybe 1,000 to 4,000)

Larger than 500 meters: 10,000 (maybe 5,000 to 20,000)

Larger than 100 meters: 300,000 (maybe 150,000 to 1 million)

Larger than 10 meters: 150 million (maybe 10 to 1,000 million)

A 500-meter asteroid crashing into a desert—for example, the Outback of Australia or the Sahara—would devastate an area of about 160,000 square kilometers and cause substantial damage over a far greater region. For example, if the asteroid fell in the Outback, all of the cities in Australia would almost surely be shaken flat. This would not, however, be the worst-case scenario. The consequences of the same asteroid arriving a few hours earlier and perhaps landing in the Pacific Ocean between New Zealand and Tahiti would be far worse. This is because the impact would generate an enormous tsunami (a huge ocean wave).

The threat of tsunamis caused by asteroid impacts has only recently been recognized, due to the work of Jack Hills and Patrick Goda of the Los Alamos National Laboratory in New Mexico. They have performed calculations showing that the hypothetical 500-meter asteroid mentioned earlier would produce a deep water wave 50 to 100 meters in amplitude, even at a range of 1,000 kilometers from ground zero. Since the tsunami height could be amplified by a factor of 20 or more in the run up as continental shelves are encountered, we are referring here to a tsunami several kilometers in height. Even if the impact were between New Zealand and Tahiti, the tsunami breaking on Japan would be perhaps 200 to 300 meters high, and heaven help New Zealand and Tahiti themselves!...

What might be the expected number of deaths from an event such as a 100-meter asteroid's arrival?

Therefore a 100 meter impactor, detonating in the atmosphere and laying waste to 10,000 square kilometers of land mass, might be expected to kill 100,000 people, neglecting the effects of a tsunami. Any estimate of the effect of a tsunami is still debatable, but the ocean's ability to transport the energy of the impactor through the wave over a long range to the very regions where human settlements tend to be concentrated (coastal plains) warrants at least a tenfold increase in the expectation of deaths in addition to that from direct blast, possibly over a hundredfold. That is, for small impactors, we profit from the fact that humankind is concentrated in certain areas, the atmospheric detonation most likely being over an unpopulated region, but we lose from the fact that the oceans are able to propagate the effects of such an explosion over a much wider area, perhaps a whole hemisphere. We are therefore talking about minimally a 1-million-death event (100,000 in the direct blast. the rest because of the tsunami.

To illustrate the difficulty of such calculations consider the Pacific Ocean as a target... Such an event would produce a tsunami that could deluge all of the cities around the Pacific rim.

What about the 2-kilometer diameter impactor ? As an absolute minimum we might expect 25% of the human race to die as a result of such an event, with a more likely figure being well in excess of 50% since it would be the low-technology, mass-population, Third World countries that would be less able to cope. They have neither the advanced agricultural capabilities nor the food stores to survive through a period of duress; witness the famines that occur in Africa during every drought. Even with a figure as low as 25%, this implies 1.5 billion deaths....

Meteor storms, themselves, are not dangerous, except perhaps to astronauts and satellites, because small meteoroids burn up in the atmosphere. But much more infrequent than a meteor storm is an asteroid storm, when by mischance the Earth passes right through the orbit of a comet either just before or just after the comet comes through that point; recall that the larger fragments will be concentrated close to the nucleus. Such close transits may be rare, but they will occur much more often than comet nucleus impacts on the Earth. And if a comet has an associated complex of substantial (50- to 300-meter) objects co-orbiting with it, then clearly we would be in trouble. The sky would light up, either night or day, with a spectacular influx of shooting stars and fireballs, but with them would come rocks as large as a city block which would punch deep into the atmosphere before detonating, wreaking death and destruction on the inhabitants below... For example, the largest known Earth-crossing asteroid is 8 kilometers in size, which means that it has a mass 500 times that of a 1-kilometer asteroid; thus eight or ten 8-kilometer (or larger) asteroids could have a total mass in excess of that of the few thousand 1-kilometer or so Earth-crossers...

But these are only the objects that we currently observe. In reality, there have been larger Earth-crossers in the past. There is clear evidence of this from both lunar and terrestrial craters. If the Chicxulub(Yucatan) crater is in fact 400 kilometers across, the impactor may have been 20 kilometers or more in size, and even if the initial size estimate of 180 kilometers is accepted, this still implies an impactor larger than any known Earth-crosser observed in modern times (the last century or so).

Already, the data from the Spacewatch telescope has provided evidence that giant comets break up so as to produce coherent streams of objects ranging from meteoroidal to asteroidal dimensions—is correct, and there is at least one such complex currently circuiting in the inner solar system. I have described the complex that we have identified as being associated with Comet Encke; however, there is also a similar grouping seemingly linked with the large Apollo asteroid 2212 Hephaistos and Comet Helfenzrieder (which, mysteriously, was observed only in 1766, not being seen again, despite its having an orbital period of only a few years). In addition, the evidence is growing that the Kreutz group of sungrazing comets is derived from a giant comet's disintegration, producing many smaller bodies that can strike the Earth at very high speeds.”

Predictions of Forthcoming Cosmic Catastrophes

NOSTRADAMUS PREDICTS Q8 A Meteor Strikes Earth

A great spherical mountain [a meteor] about one mile in diameter,
When peace gives way to war, famine and flooding,
Will roll end over end, then sink great nations,
Many of ancient origin; of great age.(I.69)

Revelations 18:

21 And a mighty angel took up a stone like a great millstone, and cast it into the sea, saying, This with violence shall that great city Babylon be thrown down, and shall be found no more at all.

22 And the voice of harpers, and musicians, and of pipers, and trumpeters, shall be heard no more at all in thee; and no craftsman, of whatsoever craft he be, shall be found and more in thee; and the sound of a millstone shall be heard no more at all in thee;

23 And the light of a candle shall shine no more at all in thee, and the voice of the bridegroom and of the bride shall be heard no more at all in thee: for thy merchants we the great men of the earth; for by thy sorceries were all nations deceived.

"Behold, the tempest of Yahweh, even his wrath, has gone forth, yes, a whirling tempest: it shall burst upon the head of the wicked. The anger of Yahweh shall not return, until he has executed, and till he has performed the intents of his heart: in the latter days you shall understand it perfectly." (Jeremiah 23:19-20)

"In this manner says Yahweh of hosts, Behold, evil shall go forth from nation to nation, and a great tempest shall be raised up from the utmost parts of the earth. And the killed of Yahweh shall be at that day from one end of the earth even to the other end of the earth: they shall not be lamented, neither gathered, nor buried; they shall be dung upon the face of the ground." (Jeremiah 25:32-33)

"Behold, the tempest of Yahweh, even his wrath, has gone forth, a sweeping tempest: it shall burst upon the head of the wicked. The fierce anger of Yahweh shall not return, until he has executed, and till he has performed the intents of his heart: in the latter days you shall understand it., (Jeremiah 30:23-24)

Isaiah 13:

6 ¶ Howl ye; for the day of the LORD [is] at hand; it shall come as a destruction from the Almighty.

7 Therefore shall all hands be faint, and every man's heart shall melt:

8 And they shall be afraid: pangs and sorrows shall take hold of them; they shall be in pain as a woman that travaileth: they shall be amazed one at another; their faces [shall be as] flames.

9 Behold, the day of the LORD cometh, cruel both with wrath and fierce anger, to lay the land desolate: and he shall destroy the sinners thereof out of it.

10 For the stars of heaven and the constellations thereof shall not give their light: the sun shall be darkened in his going forth, and the moon shall not cause her light to shine.

11 And I will punish the world for [their] evil, and the wicked for their iniquity; and I will cause the arrogancy of the proud to cease, and will lay low the haughtiness of the terrible.

Joel 2:

30 And I will shew wonders in the heavens and in the earth, blood, and fire, and pillars of smoke.

31 The sun shall be turned into darkness, and the moon into blood, before the great and the terrible day of the LORD come.

32 And it shall come to pass, [that] whosoever shall call on the name of the LORD shall be delivered: for in mount Zion and in Jerusalem shall be deliverance, as the LORD hath said, and in the remnant whom the LORD shall call.

J. Smith Matt.24:

4 And Jesus left them, and went upon the Mount of Olives. And as he sat upon the Mount of Olives, the disciples came unto him privately, saying: Tell us when shall these things be which thou hast said concerning the destruction of the temple, and the Jews; and what is the sign of thy coming, and of the end of the world, or the destruction of the wicked, which is the end of the world?

33 And immediately after the tribulation of those days, the sun shall be darkened, and the moon shall not give her light, and the stars shall fall from heaven, and the powers of heaven shall be shaken.

Revelation 6:

12 And I beheld when he had opened the sixth seal, and, lo, there was a great earthquake; and the sun became black as sackcloth of hair, and the moon became as blood;

13 And the stars of heaven fell unto the earth, even as a fig tree casteth her untimely figs, when she is shaken of a mighty wind.

14 And the heaven departed as a scroll when it is rolled together; and every mountain and island were moved out of their places.

Revelation 8:

7 ¶ The first angel sounded, and there followed hail and fire mingled with blood, and they were cast upon the earth: and the third part of trees was burnt up, and all green grass was burnt up.

8 And the second angel sounded, and as it were a great mountain burning with fire was cast into the sea: and the third part of the sea became blood;

9 And the third part of the creatures which were in the sea, and had life, died; and the third part of the ships were destroyed.

10 And the third angel sounded, and there fell a great star from heaven, burning as it were a lamp, and it fell upon the third part of the rivers, and upon the fountains of waters;

11 And the name of the star is called Wormwood: and the third part of the waters became wormwood; and many men died of the waters, because they were made bitter.

Revelation 9: 1 AND the fifth angel sounded, and I saw a star fall from heaven unto the earth

Moses 7:

61 And the day shall come that the earth shall rest, but before that day the heavens shall be darkened, and a veil of darkness shall cover the earth; and the heavens shall shake, and also the earth; and great tribulations shall be among the children of men, but my people will I preserve;

66 But before that day he saw great tribulations among the wicked; and he also saw the sea, that it was troubled, and men's hearts failing them, looking forth with fear for the judgments of the Almighty God, which should come upon the wicked.

Doctrine and Covenants 34:

9 But before that great day shall come, the sun shall be darkened, and the moon be turned into blood; and the stars shall refuse their shining, and some shall fall, and great destructions await the wicked.

D&C 29:

14 But, behold, I say unto you that before this great day shall come the sun shall be darkened, and the moon shall be turned into blood, and the stars shall fall from heaven, and there shall be greater signs in heaven above and in the earth beneath;

15 And there shall be weeping and wailing among the hosts of men;

16 And there shall be a great hailstorm sent forth to destroy the crops of the earth.

14 But, behold, I say unto you that before this great day shall come the sun shall be darkened, and the moon shall be turned into blood, and the stars shall fall from heaven, and there shall be greater signs in heaven above and in the earth beneath;

15 And there shall be weeping and wailing among the hosts of men;

16 And there shall be a great hailstorm sent forth to destroy the crops of the earth.

D&C 88:

87 For not many days hence and the earth shall tremble and reel to and fro as a drunken man; and the sun shall hide his face, and shall refuse to give light; and the moon shall be bathed in blood; and the stars shall become exceedingly angry, and shall cast themselves down as a fig that falleth from off a fig-tree.

88 And after your testimony cometh wrath and indignation upon the people.

89 For after your testimony cometh the testimony of earthquakes, that shall cause groanings in the midst of her, and men shall fall upon the ground and shall not be able to stand.

90 And also cometh the testimony of the voice of thunders, and the voice of lightnings, and the voice of tempests, and the voice of the waves of the sea heaving themselves beyond their bounds.

91 And all things shall be in commotion; and surely, men's hearts shall fail them; for fear shall come upon all people.

D&C 49:

23 Wherefore, be not deceived, but continue in steadfastness, looking forth for the heavens to be shaken, and the earth to tremble and to reel to and fro as a drunken man, and for the valleys to be exalted, and for the mountains to be made low, and for the rough places to become smooth--and all this when the angel shall sound his trumpet.

From Apocryphal Writings

II Esdras 15:

6. For wickednes hath exceedingly polluted the whole earth , and their hurtful works are fulfilled
37 And there shall be great fearfulness and trembling upon the earth: and their hurtful are fulfilled.
38 And then shall there come great storms from the south, and from the north, and an other part from the west.
39 And strong winds shall arise from the east, and shall open it; and the clouds which he raised up in wrath, and the star stirred to cause fear toward the east and west wind, shall be destroyed.
40 The great and mighty clouds shall be lifted up full of wrath, and the star, that they may make all the earth afraid and them that dwell therein; and they shall pour out over every high and eminent place an horrible star.
41 Fire, and hail and flying swords, and many waters, that all fields may be full, and all rivers, with the abundance of great waters
42 And they shall break down the cities and walls, mountains and hills, trees of the wood, and grass of the meadows, and their corn.
16:12 The earth quaketh, and the foundations thereof; the sea ariseth up with waves from the deep, and the waves of it are troubled, and the fishes thereof also, before the Lord, and before the glory of his power.

2 Baruch 25:

And he answered and said to me: You also will be preserved until that time, namely until that sign which the Most High will bring about before the inhabitants of the earth at the end of days. This then will be the sign: When horror seizes the inhabitants of earth, and they fall into many tribulations and further, they fall into great torments And it Will happen that they will say in their thoughts because of their great tribulations, "The Mighty One does not anymore remember the earth"; It will happen when they lose hope that the time will awake

4 Ezra 5:

1. "Now concerning the signs: Behold. the days are coming when those who dwell upon the earth shall be seized with great terror, and the way of truth shall be hidden,
2. and the land shall be barren of faith. And unrighteousness shall be increased beyond what you yourself see. and beyond what you heard of formerly. And the land which you now see ruling shall be waste and untrodden, and men shall see it desolate. But if the Most High grants that you live, you shall see it thrown into confusion after the third period;
and the sun shall suddenly shine forth at night. and the moon during the day. Blood shall drip from wood, and the stone shall utter its voice the people shall be troubled, and the stars shall fall.

Testament of Moses

For the Heavenly One will arise from his kingly throne. Yea, he will go forth from his holy habitation' with indignation and wrath on behalf of his sons. And the earth will tremble, even to its ends shall it be shaken. And the high mountains will be made low. Yea, they will be shaken, as enclosed valleys will they fall. The sun will not give light. And in darkness the horns of the moon will flee. Yea, they will be broken in pieces. It will be turned wholly into blood. Yea, even the circle of the stars will be thrown into dismay. And the sea all the way to the abyss will retire, to the sources of waters which fail. Yea, the rivers will vanish away. For God Most High will surge forth, the Eternal One alone. In full view will he come to work vengeance on the nations. Yea, all their idols will he destroy.

Sybilline Oracles Book 3 These are ancient Old Testament period books that Josephus quoted from several times

"And God will speak, with a great voice, to the entire ignorant empty-minded people, and judgment will come upon them from the great God. and all will perish at the hand of the Immortal. Fiery swords will fall from heaven on the earth. Torches, great gleams, will come shining into the midst of men The all-bearing

earth will be shaken in those days by the hand of the Immortal, and the fish in the sea and all the wild beasts of the earth and innumerable tribes of birds, and all the souls of men and all the sea will shudder before the face of the Immortal and there will be a terror. He will break the lofty summits of the mountains and the mounds of giants and the dark abyss will appear to all. High ravines in lofty mountains will be full of corpses. Rocks will flow with blood and every torrent will fill the plain. All well-constructed walls of hostile men will fall to the ground, because they knew neither the law nor the judgment of the great God, but with mindless spirit you all launched and attack and raised spears against the sanctuary. God will judge all men by war and sword and fire and torrential rain. There will also be brimstone from heaven and stone and much grievous hail will come upon four-footed creatures. Then they will recognize the immortal God who judges these things. Wailing and tumult will spread throughout the boundless earth at the death of men. All the impious will bathe in blood. The earth itself will also drink of the blood of the dying; wild beasts will be sated with flesh. God himself, the great eternal one, told me to prophesy all these things. These things will not go unfulfilled. Nor is anything left unaccomplished that he so much as puts in mind for the spirit of God which knows no falsehood is throughout the world."

Sybilline Oracles Book 8

"Stars will leave the vault of heaven. A raging storm with hurricane will lay the earth desolate and judgment of the immortal God . . . but when God changes the times . . . making winter summer, then all the oracles are fulfilled. But when the world perished . . .

All the stars will fall directly into the sea, all in turn, and men will call a shining comet "the star," a sign of much impending toil. He will judge the souls of flesh-bearing men on the tribunal when the whole world becomes barren land and thorns. Men will throw away idols and all wealth. Fire will burn-up land, heaven, and sea, A lament will rise from all and gnashing of teeth The light of the sun will be eclipsed and the troupes of stars He will roll up heaven. The light of the moon will perish. He will elevate ravines, and destroy the heights of hills. No longer will mournful height appear among men. Mountains will be equal to plains, and all the sea."

Sybilline Oracles

"God, whose dwelling is in the sky, shall roll up the heavens as a book is rolled, and the whole firmament in its varied forms shall fall on the divine earth and on the sea; and then shall flow a ceaseless cataract of raging fire and shall burn land and sea, and the firmament of heaven and the stars and creation itself it shall cast in one molten mass and clean dissolve. Then no more shall there be luminaries, twinkling orbs, no night, no dawn ... no spring, no summer, no winter, no autumn "

SybillineOracles Book 2

"And then a great river of blazing fire will flow from heaven, and will consume every place, land and great ocean and gleaming sea, lakes and rivers, springs and implacable Hades and the heavenly vault. But the heavenly luminaries will crash together. also into an utterly desolate form. For all the stars will fall together from heaven on the sea. All the souls of men will gnash their teeth, burning in a river, and brimstone and a rush of fire in a fiery plain, and ashes will cover all. And then all the elements of the world will be bereft: air, land, sea, light, vault of heaven, days, nights. No longer will innumerable birds fly in the air. Swimming creatures will no longer swim the sea at all. No laden ship will voyage on the waves. No guiding oxen will plow the soil. No sound of trees under the winds. But at once. all will melt into one and separate into clear air."

Sybilline Oracles Book 4

"But if you do not obey me, evil-minded ones, but love impiety; and receive all these things with evil ears, there will be fire throughout the whole world. and a very great sign with sword and trumpet at the rising of the sun

The whole world will hear a bellowing noise and mighty sound. He will burn the whole earth and will destroy the whole race of men and all cities and rivers at once and the sea. He will destroy everything by fire, and It will be smoking dust."

Sybilline Oracles Book 5

"But the wicked, who dispatched lawless utterance against heaven. will desist from speaking against each other but will hide themselves until the world is changed. There will be a shower of blazing fire from the clouds, and mortals will no longer enjoy bright corn, from the earth. All will remain unsown and unplowed."

2 Enoch 1:

6." The lofty mountains shall be shaken, they shall fall and be dissolved. The high hills shall be brought low: they shall flow down, melting like wax held close to a flame of fire.

7. And the earth shall be torn asunder, and all things on the earth shall perish; and judgment shall come upon all men.

8. But He will make peace with the righteous; and for the elect there will be safety and peace: His mercy shall be upon them.

9. For He is coming with His myriads even His holy ones, execute judgment against all men and He will destroy all the ungodly."

Gizeh 1: (Another Book of Enoch)

5. And all the people shall fear . . . and trembling and great fear shall seize them to the extremities of the earth.

6. And high mountains shall be shaken and shall fall and be dissolved . . . and the mountains shall flow down and be turned into side channels, and shall melt like wax before a flame

7. And the earth will be rent with a splitting and a crackling, and everything on the earth will be destroyed.

1 Enoch(Black) 102:1. "And when he gives forth his voice against you,

2. will ye not be shaken and affrighted by the mighty sound? And the whole earth shall be shaken, and trembling, and thrown into confusion....

3. And the heaven and its lights be shaken and trembling, [and] all the sons of the earth."

Zoroaster (~2000 BC) a Persian Prophet

" Ahriman (Satan) will have great power during his last three thousand years. Before the end, Ormuzd will send his prophet Sosioch, who will try to convert mankind.

Then Ahriman will make a comet hit the earth causing a great conflagration. At this time Ormazd will call all the dead from their graves and give them bodies of new flesh, but they will be able to recognize their friends and relatives.

Then follows the great judgment and the separation of the wicked from the righteous. Ahriman and all the hosts of the abyss, after burning punishment, will finally be purified, and a pure eternal world will come from the fire of the old one."

This description of the religion of Zoroaster was

taken from the Library of Universal History, by Israel S. Clare. vol. 1

From Normon Cohn's book Cosmos, Chaos and the World to Come (1993)

" O Mazda, by Thy bright blazing fire and molten metal, is a sign to be given among all living beings, to destroy the wicked man. The very appearance of the world will change. The earth will be flattened by the fiery flood, so that its surface will be a single level plain the snow-covered mountains of Iran—first thrown up as a result of Angra Mainyu's onslaught — will be no more"

Vision of Charles Evans

In August, 1894 an article appeared in The Contributor, (Vol. 15, No. 20, pp. 638-647) a forerunner of The Improvement Era, entitled "A Dream." In the article, an account was given of a vision which Charles D. Evans, a patriarch in Springville, Utah, had been given of the last days.

"... A voice now sounded aloud these words. "Yet once again I shake not the earth only, but also heaven. And this word yet once again signifies the removing of things that are shaken as of things that are made; that those things that cannot be shaken may remain."

Earthquakes rent the earth in vast chasms, which engulfed multitudes; terrible groanings and wailings filled the air; the shrieks of the suffering were indescribably awful. Water wildly rushed in from the tumultuous ocean whose very roaring under the mad rage of the fierce cyclone, was unendurable to the ear. Cities were swept away in an instant, missiles(meteors,asteroids) were hurled through the atmosphere at a terrible velocity and people were carried upward only to descend an unrecognized mass. Islands appeared where ocean waves once tossed the gigantic steamer. In other parts voluminous flames. emanating from vast fires, rolled with fearful velocity destroying life and property in their destructive course. The seal of the dread menace of despair was stamped on every human visage; men fell exhausted, appalled and trembling Every element of nature was a demon of wrathful fury. Dense clouds, blacker than midnight darkness, whose

thunder reverberated with intonations which shook the earth. Obscured the sunlight. Darkness reigned, unrivalled and supreme. "

Joseph Smiths Prophecy of The Coming of The Son of Man

Documentary History of the Church Vol 5 : 17 : 336

“ The coming of the Son of Man never will be--never can be till the judgments spoken of for this hour are poured out: which judgments are commenced. Paul says, "Ye are the children of the light, and not of the darkness, that that day should overtake you as a thief in the night." It is not the design of the Almighty to come upon the earth and crush it and grind it to powder, but he will reveal it to His servants the prophets. There will be ...signs in the heavens above and on the earth beneath, the sun turned into darkness and the moon to blood, earthquakes in divers places, the seas heaving beyond their bounds; then will appear one grand sign of the Son of Man in heaven. But what will the world do? They will say it is a planet, a comet...”