

Rocky horror picture shows

Deep Impact

A Mimi Leder film
Dreamworks/Paramount: 1998

Armageddon

A Michael Bay film
Touchstone Films: 1998

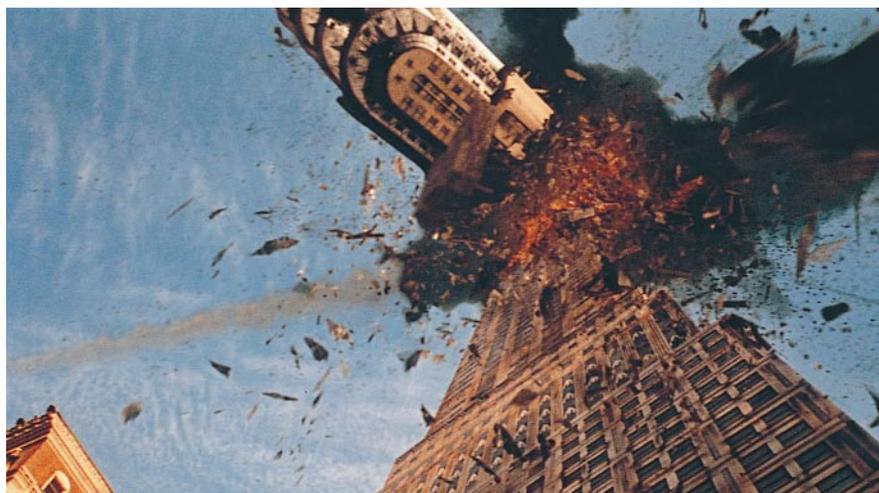
Kevin Zahnle

The penultimate summer of the dying millennium brings us two oddly similar Hollywood disaster movies in which the Earth is threatened by heavenly bodies cast loose from the vault of fixed stars.

In *Deep Impact*, the antagonist is a comet, 10 kilometres in diameter, discovered as a telescopic smudge two years before a predictable and adverse encounter with Earth. The plot centres on the story of humanity saving itself. In *Armageddon*, the antagonist is an asteroid "the size of Texas", discovered 18 days before it is set to annihilate life on Earth. The plot is the story of humanity being saved by Hollywood action heroes. *Armageddon* is probably the more enjoyable film, because it is fast, loud and silly, whereas *Deep Impact* tells its story poorly. But which of them has the better science? *Deep Impact* gets close enough to make it at least possible to discuss these matters. *Armageddon's* fantasy is so complete that any resemblance to the real Universe is accidental. Neither film allows the plot to suffer at the altar of physics.

In *Deep Impact*, astronauts armed with a dozen five-megatonne nuclear devices set off to deflect or disperse the comet a year before impact. As the gravitational binding energy of the comet is less than one megatonne, this is plausibly enough firepower to break it up. The spaceship lands, the astronauts drill holes 100 feet deep in the comet's surface and several nukes are deposited. (The environment at the surface of the comet is not entirely unrealistic. The surface should be blacker, the sky brighter and the nightside lighting diffuse, with the comet's shadow towering like an infinite cylinder into a bright sky of coma and tail. And geysers would probably not shoot off immediately on first light. But overall, it's a credible job.)

Oddly, the astronauts detonate the nuclear devices while the spacecraft is still near the comet, presumably to cripple the craft as a plot device. The shallow explosions do not have the effect one might expect: a thin layer blown off at high velocity, possibly followed by the obliteration of a hemisphere. Instead, the film-makers split the comet into two pieces: a small piece one or two kilometres across for hitting the Earth and generating enormous and spectacular special effects, and a much bigger piece from which the world can still be saved, thereby delivering the happy ending. And all this comes to pass.



Coming down to Earth: science is the first casualty in both *Armageddon* (above) and *Deep Impact* (below).



I have several caveats about the science, of which two stand out. First, the film leaves both fragments on collision course with the Earth; this is wrong. If the original comet was set to collide with Earth, then after the break-up its centre of mass, rather than either of its two fragments, would hit us. Second, the last-minute heroics of the crew would be too late: the big fragment would not blow up harmlessly. There just isn't sufficient time for the pieces to disperse; conservation of energy tells us that the impactor's footprint would widen from 10 to 200 kilometres. The environmental devastation would be comparable to, if not greater than, that from the undispersed comet.

Armageddon's science is simply silly. A few quickies: (1) only the three largest asteroids can be described as "the size of Texas"; (2) at 18 days before impact, a Texas-sized asteroid would be as bright as the stars of Orion's belt, yet somehow it evades discovery until then; (3) the energy required to split the Texas-sized asteroid is 10^{10} megatonnes, roughly a million world nuclear arsenals; and (4) an 800-foot drill-hole (everything in *Armageddon* is bigger) hardly seems like much compared with the vastness of Texas. On the other hand, the meteorite impact that takes out Paris is satisfyingly done.

Armageddon features an almost parodic adherence to the established conventions of Hollywood thrillers. But its attitude towards science (and common sense) is a kind of

ludic nihilism. Meteor showers target major cities for bombing runs. Fashion models live on deep-sea drilling platforms. Space shuttles are launched in pairs and fly in tandem like *Star Wars* fighter planes through swarms of hyper-caffeinated asteroids. Boulders lift off and fly about like flocks of pigeons. Wile E. Coyote dusts off the ashes and opens another box of Acme rockets.

At its heart, *Deep Impact* is a film that trusts in an orderly Universe, in a world of good people ruled by a just god. The movie takes the threat of wayward comets seriously, but it also takes seriously the duty to maintain order in the heavens, and it expects divine intervention on the side of good. By contrast, *Armageddon* is nervous. It inflates the asteroid preposterously, and surrounds it with ridiculous characters and surrealistic action. It is a slapstick comedy based on the oldest joke of all: the humour of pretending that the impossible is real. We make jokes of our fears, and what *Armageddon* fears is a Universe that cares no more for man and his movies than it does for a grain of sand, a Universe that would wipe us out without a thought, a Universe whose lawless laws we will not accept. (Or, on the other hand, maybe they were just trying to make a lot of money.)

Both films betray a touching belief in the power of the government to keep a big secret. But the heavens are no longer a vault of secret mysteries. The stars are not owned by governments and priests, and their courses are no longer decrypted by astrologers alone. Anyone may look, anyone may see, and anyone may compute. This is Galileo's and Newton's message to us all. A comet with Earth's name on it would be known to the world, and followed by the world, from the week it was discovered until the day we died. □

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