appeared on 5th Nov 2005

Bulldozers in outer space

S.Ananthanarayanan

That the earth may be hit by an asteroid is a possibility that that is better faced than brushed aside. Smaller asteroids, the shooting stars of the night sky collide with the earth hundreds of times a day. Fortunately the atmosphere burns them up before they reach the surface of the earth. But a larger asteroid, say 200 metres across, would survive and a collision could be disastrous. It is such an event that some say caused a cloud of dust to cover the earth for centuries and led to the extinction of dinosaurs!

The journal, *Nature*, last week described ways that scientists are devising to keep the earth safe from such an accident.

Asteroids

Asteroids are mostly rock and metal and they orbit the sun, like planets. But unlike planets they are of modest dimensions – the largest is Ceres, which has a diameter of about 1000 km, and most are the size of pebbles. Only 16 asteroids are known to be 240 km or more across. But good numbers have the 200 metre size that the earth needs to stay clear of.

Asteroids have been found inside Earth's orbit and as far out as beyond Saturn's orbit. But most live within a belt between the orbits of Mars and Jupiter. Some of the orbits cross the earth's path and several have hit the Earth in times past. The Barringer meteor crater, near Winslow, Arizona is a well preserved example

The good news is that asteroids can now be spotted months or even years before they are near the earth and if one were on a collision course, we would know well in advance. The question is, what could we do about it?

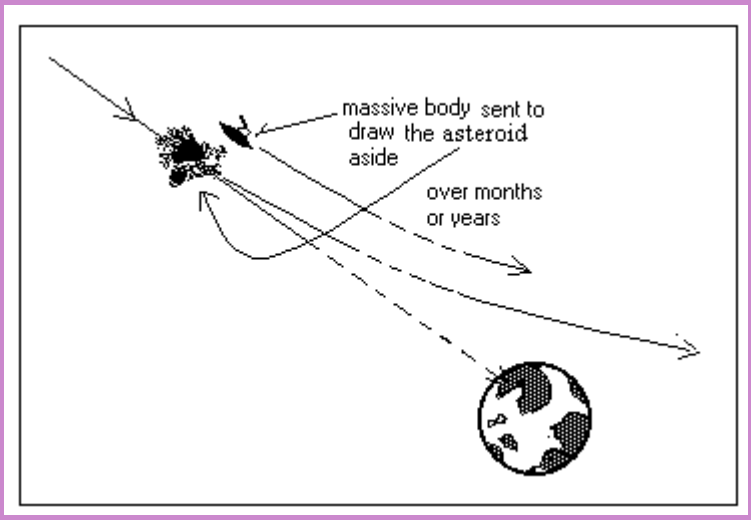
Blast it to bits?

One solution may be to use a thermo-nuclear bomb to blast the asteroid to bits – and to hope that no splinter is large enough to pose a threat. The solution is OK in principle, but there is the risk that a large bit may break free without splintering. As we still know very little about the structure of asteroids, this is hence a real possibility. And then, with controlling the explosion in the spinning asteroid being complex, the nuclear bomb could even make things worse than they were.

Another method is the hitch a rocket to the asteroid and to tow it out of the way. This is entirely feasible, but the problem is to get a hold on the asteroid. Asteroids are often not a rigid, composite object, but a collection of smaller ones. The rocket, then, cannot be easily attached to the asteroid so that it pulls the whole thing along.

The gravity tug

A solution that has now been suggested is not to attach the rocket at all, but simply to edge the asteroid off its course using gravity! This would mean launching a craft with a payload mainly of mass, so that it can create gravity, and place it near the asteroid. The craft would be propelled by rockets and would gently ease the asteroid out of the collision path. As it would have no physical attachment to the asteroid, the force would act on the whole asteroid at once and the asteroid would not disintegrate



It has been worked out that a 20 tonne craft could safely deflect a 200 metre-wide asteroid in about a year. Given the ample warning that we would have about large asteroids, it is feasible that the craft be launched and put in position well in time.