## LATEST KILLER IMPACT NEWS: by Bill Cooke Astronomy Magazine 12/04

**What can we do to prevent the collision?**

The answer to this question is, **nothing**, at least for the foreseeable future. NASA has no nuclear powered manned spacecraft and no zero-gravity mining equipment, such things being decades away. If an asteroid or comet were discovered on a trajectory ending in Earth-impact within the next few years, it would hit, and humankind would just have to deal with the consequences. We have nothing now to stop such a collision. End of answer.

**What can be done to minimize an impact's damage?**

The answer to this question is fare more substantial because actions are being taken – right now, this year, to reduce the risk of becoming a casualty of an asteroid strike.

Even harsh critics of asteroid defense will admit that, if a real threat emerged, we could develop a program capable of deflecting an asteroid in 10 to 15 years' time. In the here and now, however, we must treat the NEO threat much as we deal with that posed by hurricanes and tornadoes. This means we must be able to discover and track hazardous asteroids and, if they are going to strike, predict when and where the impact will occur.

The reigning champion search team is the Lincoln Near-Earth Asteroid Research (LINEAR) program located at Stallion Site at the north end of White Sands Missile Range in New Mexico. Consisting of two 1-meter, highly automated telescopes formerly used to track satellites, plus CCD technology developed for the Strategic Defense Initiative, LINEAR photographs large areas of sky each night.

Discovery observations from LINEAR and other search telescopes are transmitted to the Minor Planet Center, located at the Harvard-Smithsonian Center for Astrophysics in Cambridge, Massachusetts. The astronomers there calculate a preliminary orbit and position predictions fro each object and post these on a web site. Asteroid observers, many of them advanced amateur astronomers, search the appropriate areas of sky and report measurements of the asteroid's position. Such follow-up observations, carried out while the asteroid is visible, help refine the orbit.

In fact, this is an area where amateur astronomers make significant contributions, as modern technology brings all but the faintest NEOs within reach of their equipment.

As of the end of 2003, the Spaceguard Survey had discovered more than 700 near-Earth asteroids bigger than 1 kilometer. The best estimate puts the total number of such objects at about 1,000, give or take 100. This means the search is about 70-percent complete. If the present rate of discovery continues, by late 2008 or early 2009, we should achieve the survey's goal of 90 percent… Once the survey is complete, we should know if any large asteroid capable of causing global damage and mass extinction will strike Earth within the next few hundred years.

But what of the much more numerous asteroids with sizes below 1 km and above the 100-meter protection offered by the atmosphere? These will be the main focus of the next survey, consisting of telescopes like the Panoramic Survey Telescope and Rapid Response System (Pan-STARRS), being built by the University of Hawaii, and the proposed Large-aperture Synoptic Survey Telescope (LSST). Instruments like these will extend our detection limit down to 150 meter NEOs, close to the size where we can leave them to be dealt with by the atmosphere. The prospect of finding and keeping track of better than 90 percent of the entire threatening NEO population is no illusion; it appears achievable within the next 15 years.

**What about long-period comets?**

1) comets account for about 1% the total impact risk. 2) comets orbits change constantly as they shed material. 3) comets are big – usually several miles across. If one were about to strike us, there is very little we could do … except dig a hole and wait for the decades of darkness and cold to pass.

**Ponder the Sky with Paul FUNdamental Motions of the Sky. Article #12 TOPIC: Meteor Showers**
Meteor showers are just tiny pieces of space grit known as meteoroids that are rapidly heated by air friction to more than 2,000 degrees Fahrenheit and vaporize. Meteor showers are simply mother Earth doing a little house cleaning of its orbit, as it revolves around the sun. NASA's space shuttles need special heat shields for re-entry into our atmosphere that meteoroids lack. Our Moon has no atmosphere so meteor showers sandblast the surface of the Moon into the fine powder (called regolith) that allowed astronauts to leave footprints. NASA's greatest proof that we have been to the Moon is the microscopic pits in the lunar rock samples collected. These pits could have only occurred on the moon, where there is no atmosphere to vaporize them well before striking the surface. Passing comets leaves behind a great majority of meteor space debris. As the comet emerges from the deepfreeze of space toward our Sun, its frozen surface is warmed by the Sun. As the comet's icy crust vaporizes, the solar wind carries billions of tons of the loose material off the surface of the comet making a tail that is up to three hundred million miles long.

**My twelfth FUNdamental motion of the sky to ponder is that meteor showers are best after midnight because it is at this point in Earth's rotation that we are just starting to face the space debris we are revolving into**. Try this. Make a fist with your right hand and hold it at arms length away to your right so the back of your fist faces you. Your head represents the Sun and your fist represents the Earth. The back of your fist is facing the Sun so represents noon on Earth. The curled fingers on the far side of your fist would then represent midnight. Now as you slowly swing your fist to the left around your head slowly twist your fist so your thumb faces you. Notice your fingers now represent after midnight and are slamming directly into the space grit in Earths path. This is the same reason why the front windshield of your car hits more bugs then the side windows or the back windows. From dusk till midnight your sky is the back and side windows of Earth but from midnight until dawn your sky becomes the front window of sky as it plows into the space debris.

Since the Earth is roughly in the same place in its orbit at the same time each year, the Earth passes through the same debris or newly left debris by the same comet, the following table is possible to make.

**Annual Meteor Showers**

| Shower | Radiant | Active period | Peak | Rate per hour | Parent comet |
|---|---|---|---|---|---|
| Quadrantids | Bootes | Dec. 28-Jan. 7 | Jan. 3 | 40-100 | |
| Lyrids | near Vega | Apr. 16-25 | Apr. 22 | 15-20 | Comet Thatcher |
| Eta Aquarids | near water jar | Apr. 19-May 28 | May 4 | 20-50 | Comet Halley |
| Delta Aquarids | Capricornus side | July 8-Sept. 20 | July 28 | 20 | |
| Perseids | near double cluster | July 17-Aug. 24 | Aug. 12 | 50-100 | Comet Swift-Tuttle |
| Aurigids | near Capella | Aug. 25-Sept. 5 | Sept. 31 | > 10 | Comet Swift-Tuttle |
| Orionids | Taurus side of Orion | Sept. 10-Oct.. 26 | Oct. 22 | 25 | Comet Halley |
| Taurids | near Pleaides | Sept. 15-Nov. 26 | Nov. 3 | 12-15 | Comet Encke |
| Leonids | near sickle | Nov. 12-21 | Nov. 17 | 10-15 | Comet Tempel-Tuttle |
| Geminids | near Castor | Dec. 7-17 | Dec. 14 | 50-80 | Asteroid 3200 Phaeton |
| Ursids | Little Dipper Bowl | Dec. 17-26 | Dec. 22 | 10-20 | Comet Tuttle |

Note the shower is named for the region of the sky (constellation) that the shooting star appears to have originated. Doing a search on the internet near the peak day of each shower will aid you in knowing the best times to observe each shower. For instance the meteor experts may say if you watch around 2:17 AM you will observe a burst of meteors from when the comet passed by in 1499 but if you watch around 4:05 AM you will observe a burst from when the comet passed by in 1721.

The radiant (where the shooting stars appear to originate) of each shower is the worst place to look because it takes different amounts of time for the space grit to get hot enough to vaporize depending on the angle of entry, the size of the meteoroid, and the speed of entry. One night I laid on a reclining lawn chair for hours all bundled up observing the Leonids. Around 5:10 AM the show started getting real good so I ran inside and woke my wife. The two of us then stood back to back in our front yard watching opposite sides of the sky and counted out loud simultaneously 84 shooting stars in a period of about twelve minutes.

You many notice that most of the radiant region areas are unfamiliar to you. The next volume of thirteen articles will focus on the major constellations and star names in our night sky. Go Now And Teach Someone about meteor showers.