

THE SPACEWATCH PROJECT

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The Spacewatch Project was begun by Tom Gehrels and Robert McMillan in 1980 as a scientific exploration of the whole solar system for minor planets and comets. Spacewatch pioneered in the use of charge-coupled device (CCD) electronic imagery for searching and doing astrometry of solar system objects, has been scanning the night sky with a ground-based 0.9-meter optical telescope on a regular schedule since 1984, and has been discovering Earth-approaching Asteroids (EAs) since 1989.

Besides being in operation longer than any other currently active search program, Spacewatch is notable for searching fainter than most other EA surveys. This sensitivity has made it possible for Spacewatch to discover 237 EAs, 16 Centaurs or scattered-disk objects, 17 comets, and 7 Trans-Neptunian Objects (TNOs). More than 5,000 positions of EAs have been measured and reported by Spacewatch.

The hazard of impacts of comets and asteroids on the Earth is real. The impact by an asteroid larger than about one kilometer in diameter would disturb the climate on a global scale enough to stop agricultural production of food world-wide for a year or more, resulting in considerable loss of life and possibly the breakdown of civil order and infrastructure.

Spacewatch detections indicate that there are approximately 1000 Earth-approaching Asteroids (EAs) larger than 1 kilometer in diameter. The long-range objective is to catalog all the orbits so that space agencies would have plenty of warning (decades of time) to prepare spacecraft missions to deflect the path of any potential impactor.

Asteroids represent not only a threat, but also a source of information about the formation of the solar system and opportunities for the development of material resources in space. There is an increasing enthusiasm for sending space missions to comets and asteroids, both flybys and now a landing by the NEAR spacecraft on Eros. Entrepreneurs are planning commercial mining of asteroidal material. Spacewatch currently holds the record for discovering the asteroid whose orbit makes it the object most accessible to spacecraft (easier to reach than even the Moon) and specializes in finding such asteroids whose orbits are very similar to that of Earth.

After observing for 17 years with an old 0.9-meter telescope, Spacewatch has developed a 1.8-meter telescope, the largest in the world dedicated full time to discovering, recovering, and doing astrometry of asteroids and comets. Astrometric measurements with this telescope have begun to be reported to the Minor Planet Center.

Spacewatch has also been developing a detector array nine times larger than before to be used on the 0.9-m telescope, which will be upgraded with all new optics. This mosaic of CCDs will increase Spacewatch's rate of detection of EAs among objects 2-3 magnitudes fainter than are being found by the other survey groups. This is an important goal for completing the inventory of even the large EAs.

The advanced technology used by Spacewatch requires a mix of many talents and skills, thus calling for a constant effort to encourage grants and gifts to keep all the necessary team members. Contributions in the year 2001 are especially important for the personnel to observe with both telescopes and to finish developing the mosaic of CCDs to cover more sky area.

Summary of Spacewatch Project

Comets and asteroids are dangerous; the hazard is real - it is frightening. It is the greatest danger humanity faces as it is the only one that can destroy us and our habitat in one blow. Spacewatch has led the way in developing asteroid searching by electronic imagery and in the understanding of the statistics of asteroid populations.

SPACEWATCH 0.9-meter Telescope

On this telescope, Spacewatch developed the technique of scanning the sky with a charge-coupled device (CCD), and has been using it to survey for asteroids and comets since 1984.

Detections Summary:

Cumulative asteroid detections since 1990
September 11: 341,558

New asteroid designations: 42,573

NEA discoveries: 237

Outer solar system object discoveries: 23

Comet discoveries: 17

Comet recoveries: 61

The Spacewatch 1.8-meter telescope is the largest in the world dedicated full time to finding and doing astrometry of asteroids and comets. The large aperture of the telescope permits:

Faster discovery of the very small asteroids in Earthlike orbits, such as 1998 KY26 (the rapid rotator), that are coveted for their accessibility as material resources in space.

Recovery of Earth-approaching asteroids on their return apparitions when they tend to be more distant and fainter than they were at the times of their discoveries.

Finding Earth-approachers when they do not happen to be close to Earth

To operate and maintain two telescopes requires advanced technology and a mix of talent and skills.