Swerve left to avoid that satellite

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Think you have trouble getting rid of the clutter in your living room? After more than 50 years of launching rockets and satellites into space, the human race now has to deal with the clutter left behind -- or is it "above"? Dead satellites, spent rocket stages, paint flakes, and coolant from nuclear-powered satellites continue to orbit the Earth at ultrahigh velocities.

It's a serious subject. Space debris threatens the lives of astronauts and the launch of new satellites today, says Dr. Noam Eliaz, Head of the Biomaterials and Corrosion Laboratory at the School of Mechanical Engineering at Tel Aviv University. An expert in materials science and engineering, Dr. Eliaz is working with a team at Soreq NRC to create and test new materials to make the heavens safer for satellites and astronauts alike.

The oldest piece of "space junk" is the U.S. satellite Vanguard I, launched in 1958 and still in orbit. "Space debris has become a major concern recently, since collisions with such debris at ultrahigh velocities could be a disaster for spacecraft that pass through Earth's orbit," says Dr. Eliaz. "An impact could be catastrophic."

Eliaz says that the combined effects of other components in the space environment, such as atomic oxygen, might increase the damage. The researcher, a past Fulbright and Rothschild scholar at MIT, is investigating new kinds of materials that could be used on spacecraft surfaces to protect against such hazards.

Eliaz is developing nano-based materials with special mechanical properties, such as high strength and wear resistance, and controllable electrical and thermal properties. "This could lead to a superior material for the external blankets of spacecraft," says Eliaz, whose research has already been put to use by top biomedical device companies and by aircraft industries worldwide.

One candidate Eliaz and his colleagues have investigated is a hybrid nanomaterial which incorporates small silicon-containing cages that can open and react with atomic oxygen to prevent further polymer degradation.

The team includes Dr. Eitan Grossman, Head of the Materials Group within the Space Environment Section at Soreq NRC in Israel, and his staff Dr. Irina Gouzman and Ronen Verker, the latter also a Ph.D. student at TAU. Recent research by Eliaz and his colleagues at Soreq has been published in the journals Acta Materialia, Polymer and High Performance Polymers.

The team has conducted space durability studies on polymers developed by the U.S. Air Force and Hybrid Plastics Inc, and the results are being reviewed by NASA and the European Space Agency (ESA). "Our simulation studies were done on Earth to determine how space debris will impact new polymers developed to protect space vehicles," says Dr. Eliaz.

The U.S. Department of Defense recently asked Dr. Eliaz to advise them on alternatives to hard chromium plating. Now used in aircraft landing gears, chromium VI is a carcinogen, causing agencies to limit or prohibit its use.

Eliaz's research belongs to a growing field known as materials science and engineering. "This is an important area for all aspects of industry,

and Tel Aviv University is a trendsetter in this field," says Eliaz. Many global companies, including GE, Intel, Motorola, Applied Materials, General Motors and IBM, have R&D centres dealing with materials development, processing and characterization, and often look to Tel Aviv University researchers for advice.

Source: American Friends of Tel Aviv University