

# Keeping trains on track

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Thousands of people around the world have died in train wrecks caused by natural disasters. In 2004, the tsunami in Southeast Asia derailed a Sri Lankan train, killing 1,700 people. But with modern advances, these tragedies can be avoided — and a Tel Aviv University researcher, working in collaboration with teams from seven countries, is leading the way.

Prof. Lev V. Eppelbaum of Tel Aviv University's Department of Geophysics & Planetary Sciences and his colleagues are collecting high-tech sensing data from satellites, airplanes, magnetic and soil sensors, and unmanned aircraft to devise a solution that will provide a reliable early-warning system for train operators.

It's all part of the European Project FP7 research, "Integrated System for Transport Infrastructures Surveillance and Monitoring by Electromagnetic Sensing," which includes participants from Israel, Italy, France, Sweden, Norway, Switzerland and Romania. The international team of researchers aims to connect emerging technologies so that train accidents caused by avalanches, earthquakes and even terrorists can be avoided.

## A system to detect sabotage

"Sinkholes, avalanches, landslides, earthquakes, flash floods -- these disasters can cause train wrecks anywhere around the world," says Prof. Eppelbaum. "We are hoping to develop a platform that can be fitted to any railway, passenger or freight carrier, to better predict [natural](#)

[disasters](#) and possible terror attacks on rail lines." He says that his part of the study should be completed by next year.

"We are creating a new interpretation system -- allowing us to integrate cutting-edge technologies from across Europe," he says, adding that the biggest challenge, right now, is eliminating background "noise" from the data being collected.

Climatic features and parameters such as soil types and physical geography can be very different from one region to another, which makes the work even more of a challenge. Some of Prof. Eppelbaum's recent research advances have been reported in the *Zeitschrift für Geomorphologie*, the *Journal of Arid Environments* and the *Proceedings of the SAGEEP Conference* (USA).

## **On the right Amtrak**

The international team also hopes to examine the additional risk of terror attacks on trains. While all the other data collected by the research teams will be made public, this section will remain top secret.

Prof. Eppelbaum expects their methods will be adopted by the world's railway systems. As the cost of fuel for cars and planes rises, and environmentally-friendly train travel is more heavily promoted, experts predict that more Americans will be riding the rails to work and between cities. In 2008, about 30 million passengers rode on Amtrak trains, and train ridership figures have been steadily increasing.

At present, there is no monitoring system for either natural disasters or terror attacks on rail systems in America or anywhere else. Prof. Eppelbaum says he has his work cut out for him: putting together different geophysical measurements and formats of sensors, he is collecting very different kinds of data and trying to turn it into usable

information.

"It's complicated math and physics," says Prof. Eppelbaum. "And yes, it includes lots of scribbling and equations on the chalkboard."

Provided by Tel Aviv University

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