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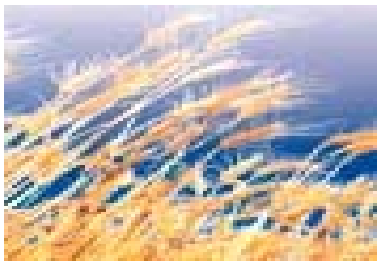

'Climate change didn't trigger agricultural revolution'

By JUDY SIEGEL
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Scientists have long believed that dramatic climate changes were responsible for the ancient Near East's Agricultural Revolution, about 8,500 BCE, in which new domesticated crops were introduced to feed the region's population. But a new study by researchers at the Hebrew University's Levi Eshkol School of Agriculture argues that farming and the introduction of new crops relies on a relatively stable climate.

Dr. Shahal Abbo and colleagues recently published their findings in the Springer journal, *Vegetation History and Archeobotany*.

Basing their argument on evolutionary, ecological, genetic and agronomic considerations, the HU researchers show why climate change is not the likely cause of plant domestication in the area. Rather, the variety of crops in the Near East was chosen to function within the normal east Mediterranean rainfall pattern, in which good rainy years create enough surplus to sustain farming communities during drought years.

The team found that farming requires a relatively stable climate and therefore is not a sustainable option in times of climatic deterioration. "We argue against climate change being the origin of Near Eastern agriculture, and believe that a slow but real climatic change is unlikely to induce revolutionary cultural changes," they concluded.

BETTER SAMPLING FOR SIGNALS

A new invention developed by researchers at the Technion Institute has the potential for improving the performance of radar, increasing the capacity of audio recorders, reducing patient exposure time to dangerous radiation and numerous other applications. The innovation, described as an "international breakthrough in sampling technology," is the building of an electric card prototype that enables the sampling of broadband signals using an especially low sampling rate. It is arousing great interest among scientists.

The researchers say it can improve the sampling, recording and processing capabilities of wideband signals by hundreds of percentages. The Technion has already registered a number of patents on the discovery and expects returns, as the world's sampling market is worth billions of dollars a year.

"In digital devices, a physical signal is stored using a series of bits. For example, music on a computer is represented by a series of numbers," explains electrical engineering Prof. Yonina Eldar, who worked on the project with her doctoral student Moshe Mishali. "Of course, the ear cannot hear numbers," she adds. "This is where the sampling and reconstruction process comes in. The goal of the sampling stage is to convert a physical signal into a series of zeros and ones. The digital 'tape' samples the audible signal and translates it into bits. The key in this stage is to perform the conversion in such a way that the true underlying signal can later be recovered.

We are all used to saying: "I saw a film of HDTV quality" or "I heard music from the digital player," adds Mishali. "We forget that humans are capable of sensing, seeing and hearing only physical signals. In the interface between the digital and analog worlds, there is a component that samples the physical signal and reconstructs it at the end of the process into the physical world that the human system can absorb."

Existing wideband samplers typically require extensive and sophisticated hardware and software to accommodate wideband signals and produce high digital data rates. But the researchers say they built a sampler based on cheap hardware whose manufacturing and computational costs would be very low and whose performance is much better.

During their work on complex mathematical formulas, the two researchers succeeded in "breaking" the basic limit established at the beginning of the previous century by the Nyquist-Shannon sampling theorem.

According to this theorem, if you sample a signal at a rate that is twice the maximum frequency of the signal, it would be possible to reconstruct the signal exactly by using appropriate processing. This theorem forms the basis for most digital devices today. Since it is desirable to use these devices in the broadest possible band, it is necessary to increase the signal sampling rate. Technological ability today limits the maximum rate at which it is possible to sample and as a result, this requires large storage capacity and a high price.

The breakthrough was achieved by using the fact that there is no broadcasting in parts of the spectrum. "The idea is to use the 'holes' in the spectrum wisely in order to significantly lower the sampling rate without damaging the signal," says Eldar. "The difficulty lies in the fact that since we don't know where in the spectrum these holes are placed, traditional mathematical models can no longer be used to characterize and manipulate such signals. What we were able to prove is that the mere fact that we know the signal does not occupy the entire spectrum enables us to reduce the sampling rate."

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