

UC SANTA BARBARA

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## **DUST IN THE WIND NOURISHES HAWAIIAN RAINFOREST**

Nowhere is an island -- at least not as far as science is concerned. So forget isolation.

Even the Hawaiian Islands, the world's most remote archipelago, do not stand alone ecologically, say new scientific findings published in the cover story of this week's *Nature*, the international journal of science.

A global web of interdependence, connects Hawaii to a continent 6,000 kilometers away, according to a major ten-year study conducted by Oliver A. Chadwick, professor of geography and environmental studies at the University of California, Santa Barbara, and colleagues at other institutions.

The far-away benefactor is Asian soil, and by atmospheric transport it brings phosphorus to the delicate soil of Hawaii's rainforest, a critical nutrient that allows plants to thrive.

Over time, the chemical breakdown of rocks in soil leaves fewer and fewer nutrients as time passes, according to the researchers. They are washed away. But these results show something new.

"What we demonstrate in the Hawaiian Islands," said Chadwick, "is that once weathering has occurred for long periods, rock-derived nutrients such as phosphorus and calcium are provided to ecosystems from the atmosphere." In the case of

calcium it is dissolved in rainwater or comes from sea-salt aerosols blown in from the ocean. Phosphorus is delivered as dust.

The researchers used isotopic tracers to tell them where the phosphorus came from.

"As soils develop in humid environments," said Chadwick, "rock-derived elements are gradually lost, and under constant conditions it seems that ecosystems should reach a state of profound and irreversible nutrient depletion." Yet they do not.

"We selected research sites in Hawaii to control for most environmental influences on ecosystem development -- except for the passage of time," continued Chadwick.

"Investigations using expertise in ecology, geochemistry and atmospheric chemistry have documented that drastic nutrient depletion does not occur as predicted," he said. "In fact, inputs of rock-derived elements from the atmosphere can sustain the productivity of Hawaiian rainforests on highly weathered soils."

Chadwick concludes, "The dependence of biological processes in Hawaii on conditions in, and transport mechanisms from, Central Asia demonstrate that ecological dynamics cannot be evaluated as a local phenomenon in isolation -- nowhere on Earth is that isolated."

Chadwick was joined in this study by L. A. Derry of Cornell University, P.M. Vitousek of Stanford University, B. J. Huebert of the University of Hawaii and L. O. Hedin of Cornell University.

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