Geoarchaeology: From Landscape to Laboratory and Back Again

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ABSTRACTS

Earthquake Archaeology. Archaeoseismology along the Alpine-Himalayan seismic zone

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Damaging earthquakes typically recur at intervals of centuries to millennia. While instrumental seismology only provides a record of earthquakes for about hundred years, archaeological evidence has the potential to determine earthquake activity over millennial time spans, especially where integrated with historical documents and geological evidence.

Archaeology can be used in three ways to help confront the seismic-hazard threat. First, where archaeological relics are displaced they can be used to study active faults. Second, archaeological information can date episodes of faulting and shaking. Third, we can search for ancient signs of seismic damage. The obvious difficulty with the last approach is that it is hard to distinguish between damage caused by an earthquake and that caused by another destructive event, such as war or the natural failure of foundations. Typologies of earthquake-characteristic damage have been proposed but rarely have they been subjected to a critical and systematic analysis. Consequently 'archaeoseismic indicators' are accepted by some earthquake scientists and rejected by others.

The key element of the *International Geoscience Programme IGCP 567* (ees.kuleuven.be/igcp567/) is our contention that archaeological evidence can make a valuable contribution to long-term seismic-hazard assessment in earthquake-prone regions where there is a long and lasting cultural heritage. We have identified the *Alpine-Himalayan region* as the ideal laboratory, because the archaeoseismological studies that have already taken root in the Eastern Mediterranean can be extended to neighbouring regions, most importantly south along North African shores, north into the Caucasus Mountains, and east into western Asia. By going from the shaking table to the archaeological remains, the project intends to develop a broadly accepted methodological framework concerning what reliably constitutes seismic damage. Such a common methodological framework is crucial for archaeoseismology to develop into a recognised and legitimate field of earthquake science. In addition, case studies from the Alpine-Himalayan belt will address specific questions relating to the locations, timing and size of past destructive earthquakes and so will seek to contribute specific information for seismic-hazard analysis.

Finally, there is a wider remit for our activities, because our research clearly has important humanitarian and economic implications. As illustrated by the 2003 collapse of the World Heritage site in the Bam (Iran) earthquake, cultural heritage sites themselves are threatened by seismic destruction. Clearly, there is a growing need to understand how ancient structures

and monuments respond to faulting and ground shaking. But, our work will also contribute to a better understanding of ancient history, elucidating why some cities were abandoned or why former societies suffered decline, and confronting the enduring attraction of fault lines in luring peoples, ancient and modern, to settle along persistent danger zones. In other words, this project will fundamentally address to our own cultural heritage.