Rapa Nui *Te topaanga o te ei o hina kauhara**: a search for moisture,*** is a multi-proxy dissertation research project that asks important questions about water, particularly indices of rain and its impact on Rapa Nui prehistoric societal development. What is missing from the knowledge of Rapa Nui and its moisture-limited environment is how climate change, especially droughts and environmental degradation affected the social evolution of its people, and answers for important questions such as: Did forest decline affect the physical environment enough to cause social decline? In order to compare changes over time properly different proxies must be compared instead of examined in isolation. Therefore this research will create a moisture profile with broad interdisciplinary inference using palynological analysis, diatoms, ostracods and oxygen isotope testing of coral to establish: 1) new radiocarbon dates, 2) a changing plant diversity and forest decline record, 3) coral and lake species detailing a new climate history profile of temperature and moisture changes back to interglacial time periods, 4) 50-100 year intervals of detail focusing on the last 2,000 years of human occupation and ecological impact of prehistoric settlement on Rapa Nui.

In order to understand the significance of this research project we must compare to what has previously been found on Rapa Nui. At one point it was believed Rapa Nui to never have had trees and lacking woody vegetation. Over time with sediment studies and pollen analysis it was discovered that the island was in fact sub-tropical and covered by a palm species that supported a dependent land snail now extinct. Heavy focus on the cultural aspects of the statue building and ahus has left the understanding of the physical environment and ecological impact by prehistoric Rapa Nui peoples lacking and open-ended for more hypotheses to further define cause and effect.

Common thinking today asserts that during the 16$^{th}$ century the culture of Rapa Nui became a highly organized Polynesian chiefdom, investing substantial labor into the creation of massive stone temples (ahu) and statues (moai). This socially complex society supported the farming of root crops such as taro and sweet potato that became intensive and was conducted under stressful conditions brought on by erratic rainfall patterns. Abruptly, in the late 17$^{th}$ century, there was a collapse of this great megalithic civilization that led to fragmented hierarchy, warfare and movement to cave dwellings. What caused this failure? One scenario states that climate was the primary variable responsible for change? Others propose that deforestation changed the landscape so drastically as to cause droughts that drastically altered productive capacity? Recently, one scholar has proposed that other cultures arrived on the island and interfered with the political process.

Human culture is as much a result of as a cause of its environmental change. In order to determine the sequence of events and the chronology of a changing ecosystem on Rapa Nui, there needs to be a comparative assessment of proxies both on land and in the sea to determine human influence. Beginning March 2005 this study, a three-part process will core Rano Kau and Rano Raraku crater lakes. First, using D-section and Livingstone techniques we will obtain sediment cores at center of lake depths between 20 and 40 meters, never attempted before on the island. In these cores we will find evidence of pollen changes and target specific species that grow under differing climate conditions, as well as establishing new radiocarbon dates. Part two of the sediment cores will target lake species such as ostracods, diatoms, sponges and fungi that can be used for isotope analysis to recreate a temperature and moisture profile before, during and after cultural collapse. This record will also provide dating for introduced species.

Part three is a collaborative effort with Stanford University to collect surface coral, sample for oxygen isotopes and establish a new climate history for Rapa Nui. As SST are scarce previous to 1981, this portion of the research will be an important base comparison to test ambient moisture for the region as stipulated by the coral samples, and moisture inferences from the sediment cores from the crater lakes. Through the analysis whatever differences are found would be human induced.

Terrestrial records that document vegetation and environmental changes viewed against long-term moisture records revealed from isotopic analysis of coral and ostracoda is an excellent research strategy for establishing the affects of human impacts on moisture limited landscapes. Through experimental procedures and accepted standards of scientific method, what is unique about this dissertation research is the convergent validity this combination of methods will offer. In order to view changes over time properly these proxies must be compared instead of created in isolation.

There is unique opportunity to include a local Rapa Nui archaeologist in the coring process as well as an archaeology student to record the process thru film documentary. This information will be useful to an audience of archaeologists, environmental archaeology, ecologists, and people studying political evolutions of agriculture

change and landscape degradation, and climate change as a social evolution. A wider audience would include environmental scientists, climate change research and anyone interested in the mystery of Easter Island.

**what is the intellectual merit of the proposed activity?**

How important is the proposed activity to advancing knowledge and understanding within its own field or across different fields? How well qualified is the proposer (individual or team) to conduct the project? (If appropriate, the reviewer will comment on the quality of prior work.) To what extent does the proposed activity suggest and explore creative and original concepts? How well conceived and organized is the proposed activity? Is there sufficient access to resources?

**What are the broader impacts of the proposed activity?** 33

How well does the activity advance discovery and understanding while promoting teaching, training, and learning? How well does the proposed activity broaden the participation of underrepresented groups (e.g., gender, ethnicity, disability, geographic, etc.)? To what extent will it enhance the infrastructure for research and education, such as facilities, instrumentation, networks, and partnerships? Will the results be disseminated broadly to enhance scientific and technological understanding? What may be the benefits of the proposed activity to society?