

# ***Hawaiian Science***

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*Are science and culture compatible?* Many modern efforts make explicit commitments to utilizing the best science to guide planning and management, as well as a commitment to the goal of ‘Ike Hawai‘i: promotion and use of Hawaiian traditional knowledge. A discussion of the epistemological differences and similarities between "classical western science" and "Hawaiian traditional knowledge" can help describe the proper context for their complementary use.

There has recently been a perceived conflict between science and Hawaiian culture. This has sometimes created a destructive polarity between those advocating Hawaiian cultural causes and those supporting projects devoted to scientific endeavors. It is based on a premise that "science" is not Hawaiian. Here, we advocate the viewpoint that an examination of the definition of science demonstrates that Hawaiian traditional knowledge embraces the major elements of the "scientific method."

*Definition of the scientific approach:* Science (in the classical western sense) can be briefly described as an approach to learning about the universe and the processes working within it. It is an approach characterized by careful observation (empiricism), manipulation (experimental approach), modeling (describing a process in narrative, mathematical, physical, or symbolic representations), and testing of predictive value of such models (theories) against a broad set of observations of phenomena related to theory.

*Empiricism:* It should be clear that many elements of a traditional Hawaiian approach are quite consistent with what would be called a scientific approach. Hawaiian traditional knowledge was empirical, based on repeated observations of phenomena in the world, bent on detecting and expressing correlations, and testing predictions and consequences. Many ‘ōlelo no‘eau take on the form of correlative statements, as in:

*Pala ka hala, momona ka wana*

The hala fruit are ripening, the sea urchins are fat

*Pua ke kō, kū mai ka he‘e*

the sugarcane are blooming, the octopus are rising

*Pua ka wiliwili, nanahu ka manō*

The wiliwili is blooming, the shark is biting

In the last example above, the blooming season for wiliwili is at the end of the Kau wela (hot season) and before the rains of the Ho‘oilo (wet season). This matches peak aggregations of sharks in shallow waters called "lālani kalalea" (rows of protruding fins) that occur at the same time. The practical consequence of prediction of shark behavior through a land phenomenon (blooming of a particular plant) is obvious. Long before you enter the water, you know to be watchful for sharks.

*Experimentation and replication:* That Hawaiians manipulated natural systems toward particular goals is well seen in loko i‘a (fishpond) engineering and the design of lo‘i (agricultural terraces) and auwai (irrigation canals). Biological manipulations (such as hand pollination of plants with the express purpose of increasing seed set) have also been documented. And although there might not have been any formal publication of results to encourage replication of experiments, there was certainly oral transmission of knowledge and testing through practice. Any knowledge that could not be practically replicated, or gave inconsistent results, would likely not be further promulgated.

*He lohe pepeiao, he ‘ike maka nō*

Hearsay [or] actually experienced

The above 'ōlelo no'eau points to the need to verify that which is heard of via direct experience. Thus in a very practical sense, Hawaiian knowledge depended on replicability of results, another hallmark of the scientific method.

*Objectivity versus intuition:* Western science has a reputation of being "coldly objective" while Hawaiian knowledge is not divorced from emotion, and is said to be guided "mai ka na'au" (from the gut). In truth, intuition and passion are critical to scientific inquiry in both Hawaiian and non-Hawaiian contexts, but the Hawaiian approach embraces intuition and feeling readily, while western science approach might view intuition as the least objective part of a process of inquiry, and mistrusts decisions made on intuitive hunches alone. This is a key point in the perceived conflict between science and culture, but any respected and experienced cultural practitioner would accede that not all hunches are reliable, and that the best intuitive guidance is based on long experience and a subconscious matching of options with what is known to be true. That is, what "feels pono" in the na'au is what fits best with a lifetime of learning. It should also be pointed out that the "objective" approach can be a limitation of western science when it allows for amoral or immoral scientific developments. Some of these have been of extreme disservice to humankind, and such a history accounts for much of the general public's current distrust of "science."

*Adaptive evolution of truth:* Science builds on a body of preexisting knowledge that was developed and promulgated by generations of scientists before us. The knowledge that is developed is continually tested and evolves over time. Information and theories that are not valid or not useful are discarded, and those consistent with observation and of predictive value are kept. The same is true of Hawaiian pursuit of knowledge. One 'ōlelo no'eau states this explicitly:

*'O ka mea kūpono, pa'a; o ka mea hewa, kāpae a'e.*  
That which is right, hold; that which is faulty, discard.

*"Wrong" ideas vindicated:* We sometimes see clear examples of Western science stumbling upon tenets of traditional Hawaiian knowledge. Hawaiians speak of the na'au (guts) as a source of ideas and wisdom, and western science long pooh-poohed the quaint idea of the intestinal tract being the "brain" of Hawaiians. However, recently the findings of Michael D. Gershon, the author of "The Second Brain" demonstrate how the enteric nervous system is relatively independent of brain-spinal cord control, and in fact, provides powerful feedback on our behavior, creating the sense of unease when a decision is potentially wrong or dangerous. Gershon speaks of the enteric nervous system as a holdover from our ancient evolutionary past, while Hawaiians speak of listening within to the voices of ancestors.

*Value of traditional knowledge:* The value of long-held traditional knowledge for current conservation efforts is seen in the following anecdote: According to mo'olelo of the island of Kaua'i, Lauhaka was the nephew of Kānealoha, and was trained to be a kia'i-manu (bird-catcher). He stayed on the cliffs of Wainiha near Mauna Hina to wait for the 'ua'u birds. The place is called Haleolauhaka (House-of-Lauhaka). Prior to 1989, the location of nesting colonies of the endangered 'ua'u (Hawaiian petrel) on Kaua'i was unknown to western science. In 1989, Sam Gon and Steve Perlman were camped at the edge of Wainiha near Mauna Hina and heard the night calls of the 'ua'u as they returned to their nests in the uluhe-covered cliffs, confirming the oral tradition. Thus, reoccupying the "House of Lauhaka" was a test of an ancient observation and a test of the validity of traditional knowledge. It demonstrated the value of mo'olelo to biologists, and the biological basis for mo'olelo.