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## LEAFLET January/February 2007 Front Page

### Water of Power, Water of Life

*"He wai e mana, he wai e ola"*



**Photos:** (Left) Hannah Kihalani Springer and Yvonne Yerber Carter sitting under the shade of lama trees in the dryland forest of Ka`üpülehu. (Right) Many ahupua'a are not watersheds, and in many cases streams themselves were boundaries between one ahupua'a and another.



Ka'eo Duarte currently works as Water Resources Manager for Kamehameha Schools. Duarte brings an impressive Western education and its "toolbox" to

bear on the issues confronting natural resource management, with an undergraduate degree from Princeton and a Ph.D in Environmental Engineering from M.I.T. Still he is careful to acknowledge his kupuna (literally "standing spring," commonly used to refer to Hawaiian elders) who have a lifetime of experience with natural resources in the places they reside. Duarte looks to the *kupuna* as a source of knowledge about how best to live in harmony with the land – now and in the future.

Read [Paradigms of Land Management: Past & Present](#) to learn more.

### Getting to the Heart of the Matter



About 85% of the food consumed in the state of Hawai'i is currently imported. In 2005, the Hawai'i Department of Agriculture calculated that the market share of local fresh fruit was 42% and that of local fresh vegetables was 36%. The University of Hawai'i estimates that the local market share for beef is about 10%. When one considers potential disruptions to imported foods as a result of increasing instability in global energy supplies, these figures could be considered disturbing. In response to concerns over food security, The Kohala Center is cooperating with the Rocky Mountain on a study to increase local food production and prospects for increased food security on the Island. So

far, the project has solicited input from as many stakeholders as possible, including local farmers (small and large), ranchers, Farm Bureau representatives, members of NGOs that work on the promotion of local food, chefs, distributors, ag-tourism operators, major landowners, academics, and farm resource efficiency consultants. Learn more about the [Island of Hawai'i Agriculture and Food Sustainability Project](#).

## Igniting a Passion for Plants

**Photo:** Kathleen Harrison telling the group about the origins of *dracaena draco*, an incense/medicinal plant from the Canary Islands and the source of the legendary "dragon's blood." This photo was taken at Botanical Dimensions reserve at Opihihale.



Renowned ethnopharmacologist Dennis McKenna and ethnobotanist Kathleen Harrison have been acquainted with one another and the rich ethnobotanical resources of Hawai'i Island since 1975. McKenna earned a Masters Degree in Botany at UH Mano'a in 1979, followed by a Ph.D. in botany from the University of British Columbia in 1984. Harrison purchased a small farm lot in Opihihale in 1977, where she planted a collection of ethnobotanical plants from around the world. She has since conducted extensive fieldwork in Mexico, South America, and Asia. McKenna and Harrison returned this January for their fifth offering of [Plants in Human Affairs](#), an intensive graduate-level course offered on Hawai'i through the University of Minnesota's Center for Spirituality and Healing during the winter semester break. This year's workshop was based at the plantation-era Hotel Honoka'a Club, with field work in Waipi'o Valley, on Saddle Road, in Volcano, and at the site of Harrison's non-profit foundation, Botanical Dimensions, in Opihihale. The goal of the course is to emphasize the importance of plants in the evolution of human culture, myths, history, health, and to the future of our planet.

*"This class is very intensive in terms of logistics, but once we're here, I really enjoy igniting the students' passion for plants. We show them a new way of looking at plants and their importance in human life."* – Dennis McKenna

Read more about [Plants in Material Culture](#). (link to back page story)

## Dry Forest Symposium



**Photo:** Wiliwili (*Erythrina sandwicensis*) seed pods. Wiliwili are one of the native species found in Pu'uwa'awa'a Dryland Forest and other dry forests along the Kona coast of Hawai'i. Photo courtesy of [Forest & Kim Starr \(USGS\)](#).

Dry forests once dominated the leeward coast of Hawai'i Island and played a vital role in the life of the Hawaiian people. Now only a few healthy dry forest ecosystems remain. On February 23 the *Nahele Dry Forest Symposium* will highlight dry land forest conservation and restoration efforts in West Hawai'i. The Kohala Center is co-sponsoring this event.

[Learn more](#) about the symposium or download the [registration form](#).

## Math Explorers 2

**Photo:** Kashayla Castiglioni delights in flying her tetrahedral kite outside The Kohala Center.

*"I personally have never known a more positive builder of self-esteem than to be recognized by one's peers as being good at math."* – Gail Lewis

The Kohala Center has mounted a new **Math Explorers** program in spring 2007 for students in grades 2-4 and 5-8. The fall 2006 after-school series was a tremendous success. Students in Math Explorers 1 created three-dimensional geometric figures, ZomeTool construction pieces, tetrahedral kites, and giant bubbles! The inspiration for Math Explorers is an innovative math enrichment program of the same name offered by the San Francisco Exploratorium. Instructor Gail Lewis combines the curriculum from the Exploratorium with her own creative ideas and materials -- to come up with activities that get students and parents excited about math. For more information on upcoming classes, call The Kohala Center at 887-6411 or visit [www.kohalacenter.org](http://www.kohalacenter.org) for registration forms and scholarship applications.



Learn more about [Why Tenacity and Creativity Matter in Math](#).

## Two Steps from Kealakekua



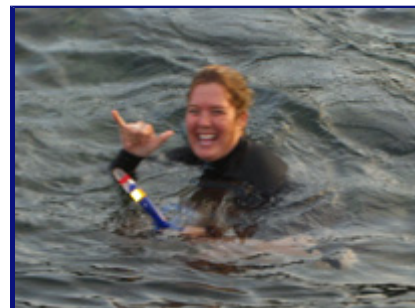
**Photo:** Teachers at the 2006 Coral Reef Ecology of Hawai'i Workshop make tapa cloth designs on the beach at Ke'ei.

If you've never been to Camp Maluhia at Ke'ei, South Kona – you have a real treat in store. This oceanfront campground is located just a few hundred yards from the south shore of Kealakekua Bay – one of the most pristine marine environments in the State. Island teachers are invited to a residential marine biology workshop at Ke'ei in early June. Join master environmental educators Susan Lehner and Erin Baumgartner and explore Hawai'i's unique marine environment. Learn how to use transects and other sampling methods, fish identification techniques, which species thrive in our tide pools, and more about "canoe" and native plants. Earn college credit through the University of Hawai'i or professional development credits through the State DOE. Bring a friend and receive a tuition discount. [Register or apply for a scholarship](#) now.

## Making Teachers Smile!

**Photo:** Participant in 2006 Coral Reef Ecology of Hawai'i workshop enjoying herself in the water.

*"The purpose of 'Making Teachers Smile' is to give teachers an opportunity to refresh themselves and recapture the reason they originally became teachers. It's an opportunity to visit a special place or explore a personal passion, in the belief that the result will translate to their students in the form of renewed enthusiasm for being in the classroom."* – Susan Maddox, Executive Director, Friends of the Future



Teachers in the West Hawai'i Complex Area (encompassing Kona, Kohala, and Honoka'a schools) are invited to apply for a special grant designed just for them by a former teacher. Grants range between \$250 - \$2,500 and selection criteria are that the grant has the potential to "enhance and improve the teacher's effectiveness, knowledge, and enthusiasm," as well as to "enhance and improve students' enthusiasm and experience." Some former recipients have utilized their grants to attend conferences, while others have designed a more personalized experience. One recipient followed the Lewis and Clark Trail to enhance her appreciation for this era of U.S. history; another attended NASA Space Camp. The possibilities are limitless.

Margaret Russell, a former teacher and school administrator, founded this fund to provide grants to teachers for their personal and professional growth. Grant funds are administered by Friends of the Future, and grants are awarded by the West Hawai'i Complex Office Grants Committee. Submission deadlines are in late March/early April. For more information, contact Susan Maddox at [future@flex.com](mailto:future@flex.com).

### Summer Opportunity for Island Youth



*"The Hawai'i Youth Conservation Corps (HYCC) is an educational, enriching, and life-changing summer opportunity that is free to any student."* – Gerry Kaho'okano, HYCC Program Coordinator

HYCC participants are mentored by and work alongside leaders in the field of conservation, and they actively participate in environmental restoration efforts throughout Hawai'i. Participants, who must be no younger than incoming high school juniors and not older than incoming college juniors, learn about environmental conservation, Hawai'i's native and endangered plants and animals, teamwork, the cultural relationship of the Hawaiian people to the land, and much more. All learning takes place in the field -- hiking and working in breathtaking habitats. HYCC participants can also expect to camp, work in a variety of ecosystems with conservation agencies, and travel inter-island (including a trip to Kaho'olawe). Team leader and member positions are available on all the major Hawaiian Islands. No previous conservation experience is necessary.

HYCC runs from June 11 through July 20, 2007. HYCC participants receive a stipend and 3 UH college credits (if eligible). HYCC participants also receive CPR, First Aid, and tool training. Applications must be postmarked by March 2, 2007. Download an application at [www.hawaiiyc.com](http://www.hawaiiyc.com) or call (808) 247-5753 for more information.

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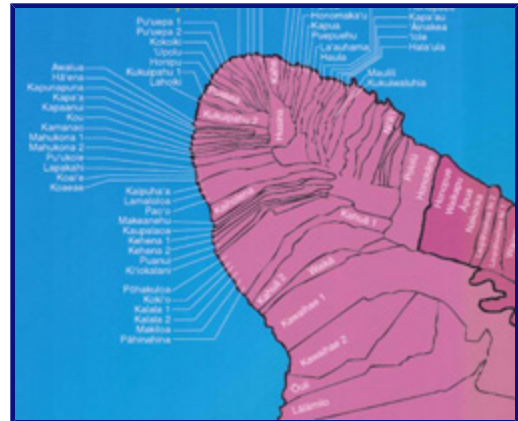
## Paradigms of Land Management: Past & Present

By Ka'eo Duarte

(compiled from notes taken by Linda Copman at Duarte's January 10, 2007 public talk in Kamuela, Hawai'i, all photos courtesy of Ka'eo Duarte)



Though *ahupua'a* are commonly characterized as "relatively narrow triangular areas of land with their apex at the highest point of an island or proximate mountain ridge, extending downslope to their base along the coast," this characterization actually only applies to a subset of *ahupua'a* statewide. It oversimplifies the very



complex relationship Hawaiians have with the *'aina* (land). Likewise, not all *ahupua'a* are discrete watersheds. This is especially true for *ahupua'a* on Hawai'i Island, which comprise a majority of *ahupua'a* statewide.

Physical delineations existed – rock cairns, trees, etc. – between *ahupua'a*. On the windward sides of the islands, *ahupua'a* were often discrete valleys, such as Waimanalo, Kailua, and Kaneohe. On Lana'i the *ahupua'a* stretched from *makai* to *makai* (one side of an island to the other). On Hawai'i's west coast there are numerous thin, rectangular *ahupua'a* extending from roughly the *mauka* (upland) timber range to the sea. Large *ahupua'a* cut off these *ahupua'a* in the far upland regions. The boundaries between *ahupua'a* are called *palena*.

Fishing, basic water, and plant needs came from your *ahupua'a* – which extended into the ocean in a very real and concrete way. Your rights were delineated by the *palena* of your *ahupua'a*, with much trading necessarily going on between *ahupua'a*.



Hawai'i is the only one of 50 states where native land divisions are recorded on maps. The Kingdom of Hawai'i made a firm commitment to the values of this place – and the *ali'i* (chiefs or nobility) made sure that the *ahupua'a* divisions were recorded legally onto maps. The *ali'i* recorded the names and boundaries of the *ahupua'a* before these were lost – so we owe them respect for preserving this heritage for future generations.



We must understand that the relationship between the people and the *ahupua'a*: the *ahupua'a* boundaries exist because the people of that place named the winds, the waters, the *pu'u* (hills) and so the *ahupua'a* came into existence. For our *kupuna* (elders) this was the way you lived. It was not an abstract concept that you wrote about. The *ahupua'a* are a projection of Hawaiians and their relationship to the land. There would be no *ahupua'a* if there were no Hawaiians.

A Nobel Prize winning scientist said that science is the observation of how nature works. I agree with this statement. Science involves learning from the lands themselves – as well as learning that is passed on for generations. In Hawai'i a lot of knowledge is place-based – based on understanding of very unique places. Knowing the names of the winds which blow in a particular *ahupua'a* is very important in that place.

## Island of Hawai'i Agriculture and Food Sustainability Project

By Lionel Bony, Rocky Mountain Institute

### Scope of the project

Since the beginning of November, Rocky Mountain Institute (RMI), in collaboration with The Kohala Center, has been conducting a research project on the agricultural and food sectors on the Island of Hawai'i. The goal of the project is to highlight for-profit and not-for-profit investment opportunities that will increase agricultural sustainability and food self-sufficiency on the Island of Hawai'i.

**Photo:** Rambutan at a local farmer's market. Photo by Diane Repp.

The project has three main goals: to increase the proportion of food grown and consumed locally, to help agricultural entrepreneurs get started and/or succeed in their businesses, and to improve the well-being and quality of life of the Island of Hawai'i community. In order to align these three goals as much as possible, RMI is taking a whole systems approach.



Using whole systems thinking means that the project considers the entire agriculture and food value chain, from production to consumer, as well as the interaction between the agricultural and food sectors and other parts of the economy, such as energy and education. Overall, a whole systems approach will enable RMI to identify the best leverage points within the agricultural system. Leverage points are opportunities where an investment of time or money can have multiple positive impacts.

The project is divided into three phases. The first phase, to be completed by early February, consists of gathering information from field interviews and existing research and analysis to understand how the

food and agriculture systems work on the Island, how they interact with other sectors, and what the major barriers to increased local consumption and production are. During this phase we will also be learning about prior initiatives and past challenges in the field so as to avoid duplicated efforts. Our goal for phase one of the project is to identify the leverage points mentioned above.



The second phase of the project will be conducted from February to June and will consist of selecting some of the leverage points and analyzing the economics of investing in them.

In the final phase, which will take place between June and September, RMI, in cooperation with The Kohala Center, will take the ideas analyzed in phase two back to the Island of Hawai'i community. The goal will be to forge consensus on how to best implement these ideas, bring together potential partners, and present recommendations for concrete actions.

### **Roles of the various partners**

Rocky Mountain Institute is acting as the lead consultant on this project, gathering and analyzing the data, and crafting the main recommendations. RMI is working closely with The Kohala Center. Given its commitment to providing high quality information for local decision-making, The Kohala Center has been helping RMI gain access to key stakeholders in the agricultural and sustainability fields. As the project turns from analysis to implementation, this local knowledge and established network will become even more important in encouraging partnerships and activities.

Additionally, The Kohala Center and the County of Hawai'i are working with the industrial ecology program at Yale's School of Forestry and Environmental Studies on a whole systems study of energy on the Island of Hawai'i. Part of The Kohala Center's role is to ensure that there is cooperation and knowledge-sharing between the two assignments.

### **Project funding**

The project is being funded by a donor who is interested in fostering self-sufficiency and positive social change in Hawai'i through entrepreneurial and philanthropic investments.

### **Background on the Rocky Mountain Institute**

Founded in 1982, Rocky Mountain Institute is an entrepreneurial nonprofit organization that fosters the efficient and restorative use of resources to make the world secure, just, prosperous, and life-sustaining. We do this by inspiring business, civil society, and government to design integrative solutions that create true wealth. Our staff shows businesses, communities, individuals, and governments how to create more wealth and employment, protect and enhance natural and human capital, increase profit and competitive advantage, and enjoy many other benefits—largely by doing what they do far more efficiently.



RMI's Research & Consulting team provides a broad range of consulting services to businesses and organizations of all sizes. The Research & Consulting team is grounded in RMI's unique blend of whole systems thinking, integrative design, end-use/least-cost analysis, and an interdisciplinary knowledge of advanced technologies and techniques.

RMI has had a presence in Kona since 2001, and has worked on several projects with the County, the State, and Hawaiian utilities and businesses.

## Plants in Material Culture

By Linda Copman, based on a lecture by Kathleen Harrison

Material culture is what humans make from the physical resources that are available to them. In many places around the world, plants are the primary materials available, and many cultures have evolved deep connections to the plants which sustain and heal them.



**Photo:** Learning about traditional Hawaiian agriculture practices from Noah, our guide at Amy Greenwell Ethnobotanical garden.

The origin myths of many cultures share a common theme centered around their most important staple or medicinal plants. In these myths, the death of a revered human or superhuman individual gives rise to a special plant to sustain the people of that culture. So it is in Hawai'i where taro holds a special relationship to the Hawaiian people.

Typically, the staple plants of a particular culture contain a complete profile of the 20 amino acids necessary to build the proteins that humans need to survive. Thus, the people who eat these plants can sustain themselves from their staple plants without animal proteins. For example, in Meso-America, the "three sisters" of maize, squash, and beans grew together. The beans climbed the maize stalks and released nitrogen back into the soil to feed the maize. The squash spread between the maize plants, controlling weeds and absorbing the nitrogen released by the beans. The three sisters provided complete proteins to sustain the Meso-American cultures even when meat and fish were scarce.

**Photo:** Luke with a pod of Inga, the "ice cream bean" tree.

Many plants have been selectively bred over generations and centuries to maximize their nutritional content and to make them easier to harvest. For example, corn has been selectively bred to reduce the size of the internal husk around each kernel – so that today all that remains are the fibrous threads that cling to the cob when we finish eating the corn. One "hidden" role of women through the ages has been to detoxify our food and make our grains digestible by various methods of preparing grains for eating. This role is in addition to the more visible role of gathering foods and medicines for human use.



Plants have also been used to make objects, such as baskets, which are uniquely adapted to the use they have been designed for. An herb storage basket may have a loose warp to allow natural air circulation, in order to minimize the growth of mold on the herbs which are stored there. A boat, on the other hand, might utilize basket making techniques to create an extremely tight weave – so tight as to prevent water from leaking through.

**Photo:** Students playing with leaves of Gunnera at Opihihale.





In many cultures the objects which are created from plants are not only useful but also have value as magical or mythical objects. These objects often have stories and songs which accompany their use, so that the magical and the practical qualities of the object overlap. Unfortunately, says Harrison, oil production has disturbed tribal life in many places around the world – disrupting traditional value structures and the roles that plants played in these cultures. As these cultures adjust to the pressures of modernity, it's important for plant habitats and local knowledge of plants to be preserved for practical, nutritional, medicinal, and spiritual purposes.

Harrison and McKenna plan to offer the sixth annual Plants in Human Affairs course here on Hawai'i Island in January 2008. They are also considering offering a version of the course in Peru in summer 2008, but this is currently only in the planning stages. Students in the current course came from across the U.S. Mainland and from Hawai'i Island, and they ranged in age from a sophomore in college to a practicing pediatrician who is earning continuing education credits. To learn more about upcoming courses, contact Kathleen Harrison at [kharrison2@earthlink.net](mailto:kharrison2@earthlink.net).

## Why Tenacity and Creativity Matter in Math

By Gail Lewis

**Photo:** Jack White puts a round bubble in a square hole!

Do you think you can fold a large sheet of newspaper in half ten times? The younger group of Math Explorers tried this one afternoon last fall. The ten 2nd – 4th grade students leaped to the challenge, folding like crazy! What they discovered is the magic of exponential growth. After the eighth fold, they were attempting to fold 256 sheets of paper at once, and it's hard to do.

That afternoon something happened - something dynamic! One 3rd Grader came up to me to have his folding checked for the fourth or fifth time. He had never gotten past eight folds. This time he handed me a triangular wad of paper instead of another of the rectangular wads I had been checking. Becoming frustrated with doing the same thing and getting nowhere, he had decided to try something different, folding in half on the diagonal instead of on the vertical.

This is what Math Explorers is about – learning to become creative and tenacious problem solvers. In his book *The World is Flat*, respected journalist Thomas Friedman emphasizes that in order for the U.S. to compete with countries like China, where 60% of bachelor's degrees are in science or engineering fields, we need to develop "dynamic" thinkers, or "individuals capable of abstract thinking and high-level problem-solving using scientific knowledge."



**Photo:** "What will the interior bubble look like when you dip a three-dimensional model made from ZomeTool pieces (a math construction kit) into a bucket of bubble solution and pull it out carefully?" The answer is different in every case, but we detected a pattern, especially in regular polyhedra like cubes, rectangular prisms, and tetrahedra. These shapes each produced a bubble that replicated the original shape but with curved, instead of straight, surfaces. Here, Matthew Bal delights in bubble math exploration.

The creative 3rd grader from my class is on his way to becoming a dynamic thinker. So are many other students in the fall Math Explorers classes. In my classes, we focus on crafting a good question and then testing it. For example, "Would adding tails to the tetrahedral kites we made out of straws and tissue paper stop them from spinning wildly in Waimea's strong and unpredictable winds?" The answer is yes – the tails made our wonderful home-built kites more stable and able to withstand

the gusts outside The Kohala Center one windy Wednesday in November.

Regular classroom math often concentrates on teaching fundamental math techniques or on whether students have the right answers. Equal emphasis should be placed on nurturing essential problem solving qualities such as flexibility in thinking and originality in coming up with other ways of solving the problem.

In Math Explorers classes, we work on non-traditional assignments in order to hone students' skills at grappling with complex or unfamiliar problems. We use experiential, hands-on exploration to understand math concepts. In Math Explorers, we encourage creativity and playfulness, which result in the students finding dynamic new approaches to math. Students have fun and "graduate" with a better understanding of the mathematical processes and patterns that govern our world.

**Photo:** Helena Dore investigates bubbles in a cube.

Students in the spring classes will be engaged in a new series of math explorations, many of which build upon the aesthetically pleasing elements of math patterns that lend themselves to artistic expression. We will be making tessellating (interlocking) shapes and designs, patterns based on circles for colorful mandalas, geometric string sculptures, and Jacob's Ladders (toys made of paper blocks and ribbons that seem to tumble downwards unexpectedly, like a water fall, as you tilt them this way and that).



My goal is to encourage students to become excited by exploring math. My hope is that they will want to continue with math courses even though this requires effort and isn't always easy. Thomas Friedman notes that "students entering the science and engineering workforce with advanced degrees in 2004 decided to take the necessary math courses to enable this career path when they were in middle school."

At the elementary and middle-school level, being good at math is mainly a matter of diligence, strong parental support, and a sense of enthusiasm to carry one through the frustrating times. These things are not beyond the scope of most children. Math is not boring or hard if you learn to see it as an exploration!

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