

REPORT ON THE PISCES INAUGURAL CONFERENCE

November 7-10, 2007

Hilo, Hawai'i

- DRAFT -

INTRODUCTION

This is a report on the inaugural conference of the Pacific International Space Center for Exploration Systems (PISCES), held November 7-10, 2007, in Hilo, Hawai'i. The purpose of the conference was to provide an opportunity for researchers and educators from industry, academia and government, along with interested parties from Hilo, the Big Island, the State of Hawai'i and the national and international space exploration and space commerce communities to learn what is planned for PISCES, take part in the discussions, and help steer its development for the maximum benefit of all the stakeholders and, indeed, of all humankind. The total number of people registered for the conference was 87. A complete list, with affiliations, can be found in the appendix.

PISCES was founded under the auspices of the Hawai'i Department of Aerospace Development, and is an outgrowth of discussions held at the annual Japan-US Science, Technology and Space Applications Program (JUSTSAP) symposia over the past several years. PISCES is a partnership between the State of Hawai'i, industry, academia and the governments of space-faring nations.

The vision of PISCES is a comprehensive, international research and education center dedicated to research and education that will develop technologies needed to sustain human life on the Moon and beyond. The mission of PISCES is to support the exploration and settlement of space through research and education.

The conference was organized into a set of opening plenary sessions to introduce the PISCES concept and hear from potential users, breakout sessions to gather input on design of the various programs planned for PISCES and closing plenary sessions to give members of the local community the opportunity to offer their perspectives on the development of PISCES. The conference agenda is included in the appendix.

OPENING PLENARY SESSIONS

The conference was opened with a traditional Hawaiian chant by Mailelalani Canario. Individuals offering words of welcome included Randy Hirokawa, Dean of the College of Arts and Sciences at the University of Hawai'i at Hilo (on behalf of Chancellor Tseng); Jim Crisafulli, Director of the Office of Aerospace Development; Mark McGuffie, Executive Director of the Hawai'i Island Economic Development Board; and Stephen Day, Chairman of JUSTSAP.

PISCES was introduced by means of a new video, a copy of which is available from the center office (email pisc@hawaii.edu). This video received wide acclamation from

those present at the conference. It was followed by an introductory presentation from PISCES Director Frank Schowengerdt. This and all presentations made at the conference will be posted on the PISCES website, <http://www.pisc.es.hilo.hawaii.edu>, in the near future.

KEYNOTE ADDRESS

The keynote address was given by Lieutenant Governor James “Duke” Aiona. He expressed strong support for the PISCES concept from the State of Hawai’i perspective as a vehicle for economic development within the state. He pledged support for continued funding of the center through the legislature.

PISCES USERS’ PANEL

Following a break, the PISCES users’ panel, which consisted of representatives from NASA, JAXA (its Japanese counterpart), US industry, Japanese Industry, US universities and Japanese universities, was convened. Members of this panel discussed the way PISCES would be used by their organizations and specific requirements they would have in order to use it. The activities outlined in this session included *In-situ* Resource Utilization (ISRU), robot and rover demonstrations, lunar habitat design, human factors, astrobiology, spacesuit testing, education and outreach programs and student internships. All the participants expressed strong interest in working with and at PISCES.

THURSDAY LUNCHEON ADDRESS

Conference participants were treated to an informative and entertaining luncheon talk by Jane Poynter, former crew member in “BioSphere II”, the Arizona habitat designed to determine how a small group of future space travelers would function in a completely closed environment. Poynter is a co-founder and partner of Paragon Space Development Corporation, which is a Tucson-based provider of life support and environmental control equipment for NASA spacecraft. She is also the author of “The Human Experiment,” in which she recounts her experiences in BioSphere II.

DEVELOPMENT BREAKOUT GROUPS

The Development Breakout Groups (and leaders) were as follows: Site Selection (Mark Henley), ISRU (Mike Duke), Robotics (Neville Marzwell), Business Plan (Dan Bland), and Education and Outreach (Beth McKnight). Following a presentation by each leader detailing the status of PISCES plans so far, the groups discussed how that particular area should develop, responding to questions posed as part of the opening presentation. The leaders presented results of the discussions in their groups to a plenary session. The following sections give highlights of each breakout group report. It should be noted that

the purpose of the breakout groups was to present the current status of the PISCES development plans and to solicit input on the directions those plans should take, and not to make decisions on any of the issues discussed. Before any decisions are made, most of these issues will be taken up with the local advisory committee currently being formed.

Site Selection

At the outset, it was strongly emphasized that PISCES has not selected a permanent site, and will do so only after exhaustive consultation with the local community, especially local cultural organizations. As with all the breakout sessions, the Site Selection sessions were of an information-sharing and brainstorming nature, with no decisions being made or expected. Suggestions for the process of site selection for PISCES included:

- Define requirements from users.
- Define site evaluation criteria.
- Choose a central location with other sites nearby.
- Use PISCES in environmental remediation

Suggestions for site evaluation criteria:

- Geotechnical features
- Deep fine-grained soil
- Chemical and mineralogical composition
- Homogeneity of material
- Accessible by Public
- Privacy & Security
- Long contiguous range (rovers)
- Diversity of experiments
- Large Area – e.g., 15 km long
- Variety of terrain to choose from nearby
- Infrastructure – machine shop, hospital, base camp, hotel
- Proximity to existing roads
- Medical access

Some possible locations for PISCES test sites included the following, offered at the start of the breakout group session by Mark Henley:

- Kilauea
 - Halemaumau Crater
 - Lava tubes
- Mauna Kea
 - Areas near the Onizuka Visitor Center, including the Haiwahini Craters
 - Apollo “Moon Valley”
 - Summit
- Mauna Loa
 - Recent Lava Tube
 - Spatter Cone Volcanic
- Saddle between Mauna Kea & Mauna Loa

- Near or in US Army Pohakuloa Training Area
- South Point – Pohala Ash

Additional locations suggested by the group during the discussions included:

- Kilauea
 - Kilaueaiki/ cindercone
 - Ainahou Ranch (Stanford U)
- Mauna Kea
 - Pu’u Makanaka (remote)
 - Skyline area
 - Freddie Norbriega Ranch and other private properties
 - Pu’u Umuamoa
 - Roads at 6,000 & 9,000 feet
- Saddle between Mauna Kea & Mauna Loa
 - Pu’u Kee Kee
 - Pu’u Nene (Mars-1 simulant)

In-Situ Resource Utilization (ISRU)

Current thinking on the ISRU program was presented, which included:

- ISRU is critical to any permanent human outpost on the Moon or Mars.
- PISCES will provide a central location where ISRU capability can be demonstrated in an integrated environment with other simulated lunar outpost infrastructure and activities.
- PISCES will undertake a research program that will lead to the ability to include ISRU products in full system demonstrations.
- ISRU systems and capabilities will be incorporated into PISCES education and public outreach activities

Current ISRU demonstration strategy was presented, as follows:

- PISCES will provide a realistic environment for testing of proposed ISRU systems, including infrastructure for integration, such as life support and power systems, communications and control.
- Some systems may be selected for incorporation into the PISCES simulation facility on a continuing basis, transferring last generation hardware to PISCES.
- Early tests would likely include excavation and oxygen extraction.
- Hawaiian simulants are readily available and will be used. MSFC should characterize Hawaiian simulants in same way that other simulants are being characterized

Strategic questions posed to the group included the following, with responses received as indicated in the sub-bullets denoted by “-“:

- What is the basic set of ISRU processes and supporting systems that should be included early in the program?
- What are the interfaces between a lunar ISRU system and other systems that must be implemented in a successful analog facility?

- What infrastructure is needed in order to properly support demonstrations?
 - Machine shop
 - Power supplies
 - Simulated lunar materials
 - KSC/JSC to define as part of IPP program with PISCES
 - Need to define people-support infrastructure for given number of people
 - Should PISCES develop its own integrated modeling capability?
- Who are likely users?
 - NASA; currently establishing analog needs
 - International partners; opportunity for joint tests with US providers
 - Industry developers of ISRU systems; recognition as partners in PISCES; potential IP protection issues
 - Universities; need access to lower-cost analog sites
- Can potential benefactors be identified who might support the development of PISCES infrastructure?
 - Users should not have to pay for infrastructure development

The PISCES research program was discussed, the principles of which are the following:

- Non-competitive with current NASA-funded ISRU research
- Interactive with facility development
- Builds on other technologies; eg., excavation
- Potentially, helps develop Hawaiian expertise or industry

The following example of PISCES research was discussed:

- Fabrication of construction materials with ISRU
 - Utilizes thermal energy, which is abundant in Hawai'i
 - May require processed regolith (other than direct melting and casting)
 - Utilize Hawaiian regolith simulant available in large quantities
 - Can influence further development of facility
- Example: solar reflectors fabricated from local regolith materials

The question was posed, what should be the elements of the PISCES Outreach and Education program as it relates to ISRU? Some examples included:

- Design competitions
- Student Interns
- Visitor briefings and demonstrations
- Hawaiian community interactions

A summary of new ideas coming out of the ISRU breakout group included:

- Need to network among existing analog sites; e.g., Canadian
- PISCES can help in developing standards/interfaces; but need flexibility in developmental stages; need early success stories.
- Need to ensure compatibility with environmental constraints.
- Some tests may be complex, with complex partners.
- External users need reliable infrastructure support.

- Develop PISCES ISRU user group to coordinate testing plans.
- Industry may be willing to contribute technology in-kind.
- Consider existing models for ensuring local community support for activities that will modify the environment.
- Consider dust problems.
- Construction of the PISCES habitat could have positive feedback for other testing.

Robotics

The purposes of the robotics breakout sessions were as follows:

- Identify stakeholders; user community needs and expectations for sustainability.
- Identify desired capabilities for PISCES in Automation, Robotics, and Man-Machine Interface.
- Identify projects for a strategic fit into PISCES overall architecture.
- Identify PISCES Robotics requirements.
- Achieve leverage and strategic fit with other on-going PISCES activities.
- Develop a strategic plan for the first year's activities.

A summary of current thinking within PISCES on the robotics program:

- PISCES will provide a central test-bed location where robotics can be demonstrated with other simulated lunar outpost infrastructure and activities.
- Robotics is critical to any permanent human outpost on the Moon and Mars.
- PISCES will undertake a research and development program leading to dual-use terrestrial capabilities and products for local business growth.
- Robotics will be incorporated into PISCES public outreach activities to generate future workforce in robotics and automation core competencies for Hawai'i.

The following questions were posed to the group, with responses given for each in the sub-bullets denoted by “-“:

- What must be achieved early on in the program to grow in the right direction and gain momentum?
 - A database justifying the uniqueness of Hawai'i as a lunar analog.
 - Criteria for use of candidate sites on the Big Island.
 - At the beginning, minimum logistics support/facilities are required (a hotel or a place to set camp), as customers will come with robots, equipment, trailers, power generators, instrumentation and hygiene support.
 - Later, to gain a competitive edge, more formal logistic support is needed: living quarters, test facility, researchers, manpower, electric power, home depot type support, operational control center, communication (data and image), tele-operations with time delay, etc.
- What steps are required for a successful analog facility?
 - Develop a business case that clearly answers the question of why NASA and industry should come to Hawaii to develop space exploration capabilities.

- Develop a unique package of integrated capabilities, including but not limited to terrain , geological conditions, facilities, support, etc.
 - Offer intangibles such as teamwork, public inspiration, coordination between heterogeneous groups, spoken Japanese language, etc.
 - Maintain flexibility to accommodate to changing requirements and political instability.
- Who are the Stakeholders?
 - Local cultural, societal and political believers in the mission of PISCES from Hawaiian communities, local business leaders and local government.
 - Grassroots organizations such as the Moon, Mars, Planetary Society; Local Business Societies; International Space Industry.
 - Univ. of Hawai'i faculty who would like to collaborate.
 - NASA, DoE, Military, JAXA, CSA if a case is made.
 - Can potential benefactors be identified?
 - If there is an initially strong commitment from State and local governments to pay for infrastructure, land and real-estate.
 - Users will pay for product, engineering and services.
 - Faculty can compete for research grants and contracts.
 - What kinds of team members should PISCES invite?
 - Universities in United States, Japan and other space-faring nations.
 - Government agencies.
 - National and international space industry

Preliminary NASA requirements for robotic operations at an analog site include:

- Test bed capable of validating technologies at TRL level of 6 and beyond
- Uniqueness in simulating the Moon regolith properties, environment, volcanic soil and dust conditions
- Infrastructure: Staging, Power, Access, Handling, Cranes, Habitat like Structures
- Traverse Range up to 100 Km, Area of 2 Km X 13 Km
- Robotics: mobility (manned and unmanned), multipurpose chassis, simulated lunar missions environment for 2 weeks, automated rock selection and processing
- Develop a robust workforce development plan (BS. and MS. in Robotics and Space Engineering), and HS., Technical Schools certification in computer programming, robotics, space systems, wireless communication, etc.
- Actively track opportunities for funding and collaboration between the University of Hawaii at Hilo and NASA (its Centers), DoD, NSF, Industry, Internationals (proposals, grants, contracts)

Business Plan

The purposes of the Business Plan breakout sessions were as follows:

- To consider a “straw-man” approach for development of a PISCES Business Plan including suggestions for contents
- To amend the straw-man outline for presentation to PISCES plenary session

It was not the charter of this group to determine (or even discuss in detail) the “right” answer to any question nor to delve into the implementation approach for any section or subsection. The challenge was to discuss and recommend a workable framework for a PISCES Business Plan. A “straw man” documentation tree for the business plan development is given in Figure 1.

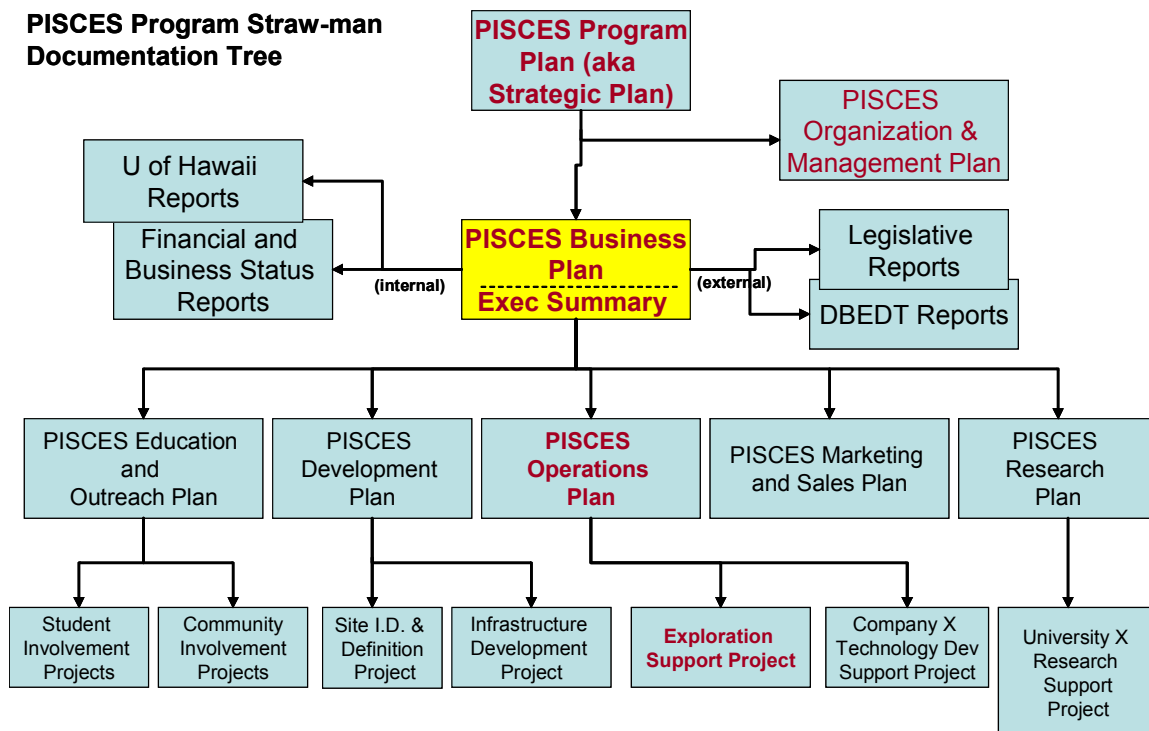


Figure 1 - PISCES Program Straw-Man Documentation Tree

Enabling questions, with responses in sub-bullets (denoted by “-“) from both the presenter and the group were:

- Who develops the Business Plan?
 - PISCES Director or designees
 - DBEDT, Office of Aerospace Development Director or designees
 - Contracted Organization
- How will Business Plan be used?
 - Show revenue, cost and development schedule projections to stakeholders
 - Source material for annual budget requests to the State

- Establish priorities for development of lower tier plans; e.g., Marketing and Sales Plan, Development Plan, Research Plan, etc)
- Will the Business Plan be a public document?
 - Is PISCES in competition with other analog sites for customer resources?
 - Will there be Proprietary and Export Control considerations?
- When must the Business Plan be completed?
 - Must support end-of-fiscal-year annual budget request to the State?
 - Near-term business and operational plan needed for current IPP awards
- What is PISCES and why is it in Hawai'i?
 - Outpost model?
 - Technology test bed?
 - Technology showcase?
 - Research site(s)?
 - Education?
 - Work force development?
 - Modeled after Imiloa - interactions?
 - All or part of the above?
- What are PISCES' focused product and service objectives?
 - Understanding and meeting customers' requirements
 - Direct participation in customers' analog site utilization planning
 - Evolutionary capabilities corresponding to exploration objectives
 - Life-cycle and sustaining capabilities considerations
 - Intellectual property considerations
 - Export control considerations
- Who are the targeted customers and when will they need PISCES?
 - Customer descriptions, scope and trends; e.g. NASA, JAXA, State of Hawaii, U.S. and other industry, commercial space entities
 - Major customers' interests
 - Problems, obstacles and opportunities
 - Market research
 - Other analog sites - competition or collaboration
 - Infrastructure support description, scope and trends
 - For example, Hawaii Island, Hilo, Big Island Community, UHH
- Should PISCES encourage a blend of public and private sector users?
 - 5-7 Year Utilization Profile
 - Definition of PISCES Team roles and responsibilities
 - Definition of customer-specific strategies and techniques
- What is advocacy-to-infrastructure transition plan & schedule?
 - Achieving Hawaii political and cultural advocacy
 - Involving the customer from the outset
 - Site(s) and facilities definition and development priorities
 - Site(s) permits and regulatory approvals
 - Infrastructure requirements definition and phasing (keep customer's ease-of-use at the forefront as infrastructure evolves)
 - Project definition and implementation approach
- How will PISCES be organized and managed?

- Describe PISCES as an “industry/university/government partnership” according to one of the models below
 - o CCDS/RPC-type, university owned partnership model (e.g. Colorado School of Mines, Bioserve) – no corporate tax or FAR applicability, OMB Circular A-21 applies for grants and contracts
 - o 501(c) 3 non-profit model (e.g. Woods Hole Oceanographic Institute, JPL) – no corporate tax; special FAR section applicability
 - o For-profit research center of institute model (e.g. SBIR shops) – corporate tax and FAR applies
- Key personnel / organization definition
- Product and service delivery description
- Facilities/supplies logistics description
- land use considerations
- Native Hawaiian and customer integration considerations
- Human resource considerations
- What is the PISCES 5-yr revenue & cost plan?
 - Define capital development funding sources and methods
 - Define revenue sources and phasing (5-7 year horizon)
 - o Government agencies
 - o Commercial entities value
 - Define cost projections and phasing (5-7 year horizon)
 - o Indirect
 - o Direct
 - Define “value” projections for state of hawaii (5-7 year horizon)
 - o Jobs growth projections
 - o University undergraduate/graduate program growth
 - o Prestige factor
 - Business model reporting requirements and methods
- What experience do we bring to the table? What solid evidence of customer/investor interest can we include?
 - Key personnel bios
 - Site pictures and artists conceptions
 - Hawai’i state advocacy documents, media, articles
 - Customer letters of interest, contracts and agreements

Education and Outreach

The overall goal of the PISCES Education and Outreach program is to reach out and educate target audiences, using specific messages and vehicles that would do the best job of connecting with them. Specific objectives of the program are to:

- Build public awareness and support of PISCES
- Expand and enhance the image of UH-Hilo
- Help attract, maintain, involve and promote users/partners
- Help guide marketing, fundraising, and gov’t relations

- Inspire the next generation of space scientists
- Build interest & support for space exploration

Three models were discussed for the program; a web-based approach like that employed by NASA-Langley, using cultural events such as canoe voyaging, and holding grassroots meetings with stakeholders in the mold of the Mauna Kea Management Board.

Audiences to be targeted include:

- Community
 - General public/residents of Big Island.
 - Native Hawaiians.
 - UH system.
 - Local business and industry.
 - Teachers, students, administrators for K-16.
 - Potential users, partners in science, astronomy, research and education.
 - Historical, cultural organizations.
- Government
- Education
- Business and Industry
- Space Research & Development

Messages to the community include:

- Features moon base lab where terrain is similar to lunar surface.
- Develops dual-use technologies for humans to live on moon and beyond, and to improve life on Earth.
- Is about extending humanity's presence beyond Earth.
- Draws from Hawaiian culture --- sustainability and voyaging.
- Is test-bed for planetary protection, minimizing the footprint of human habitation.
- Supports environmental protection.
- Complies with sustainable building practices.
- Supports making "Green" a part of visitor experience.
- Provides educational resources for K-16.
- Listens to community priorities and concerns.
- Actively involves local citizens.

Vehicles for reaching the community include:

- Web
- Design competitions
- Visitor briefings
- SpaceClass in schools
- Advisory Council
- Astro Day and Journey to the Universe

- Face-to-face with Community Leaders
- News Media
- Internships
- Demonstrations
- Walk the talk: low environmental impact in all we do.
- Host events, seminars year-round.
- Invite students to stay in habitat.
- Web-cam – allowing public to tie in to rovers, get updates, etc.
- Connect PISCES with Earth Day, Space Day and other major observances.
- Establish internships for UH-Hilo students.

The international audiences, including the countries of U.S., Japan, Canada, Malaysia, India, Korea, are:

- Governments.
- Aerospace companies.
- Space programs.
- Universities.
- Students.
- ISU and other international organizations.

STUDENT DESIGN PRESENTATIONS

The PISCES Student Design Competition was launched by Mike Duke in January 2007, and the winners were announced at the conference in November 2007. There were six teams entered, from which three winners were selected and invited to send teams to the conference to present their designs. The winners were Honolulu Community College, Colorado School of Mines and Colorado University at Boulder. Following the presentations at the conference, the Honolulu Community College team was picked unanimously as the grand prize winner. All three winning teams were recognized and a book was presented to the HCC team at the student awards banquet on Thursday evening. Presentations from the three winners will be posted on the PISCES website in the near future. The after-dinner talk was given by Mike Duke. He shared his experiences in NASA and his views on how space settlement should be led by the private sector.

LOCAL GOVERNMENT PERSPECTIVES PANEL

The local government perspectives panel was chaired by Hawai'i Director of Aerospace Development Jim Crisafulli, who also spoke as a member of the panel, Senator Will Espero, Representative Clift Tsuji, Representative Gene Ward and Hilo Mayor Harry Kim. All speakers on this panel expressed strong support for the PISCES concept, along

with warnings and advice on how to address local environmental and cultural concerns. The concern most often mentioned was the sacredness of Mauna Kea, with Mayor Kim cautioning PISCES to “remember, that when you tread on this mountain you are treading on our soul.” During this session, it was strongly suggested that PISCES develop a cultural advisory board.

FRIDAY LUNCHEON ADDRESS

The Friday luncheon address was given by Minoor Dastoor, Program Executive for the Innovative Partnerships Program (IPP) Seed Fund at NASA Headquarters. Dr. Dastoor presented the IPP seed program goals and objectives in the context of NASA’s overall plans for exploration, science and aeronautics. He announced that NASA was awarding two seed-fund grants for work on ISRU and robotics at PISCES and expressed strong support for this new partnership.

ACADEMIC PERSPECTIVES PANEL

The academic perspectives panel was chaired by UHH Physics and Astronomy Chairman and PISCES Deputy Director Robert Fox. The panel included Randy Hirokawa, Dean of the UH Hilo College of Arts and Sciences; Larry Gray, President of the student Astrophysics Club; Philip Castille, UH Hilo Vice Chancellor for Academic Affairs; Christian Viellet, Director of the Canada-France-Hawai'i Telescope; and John Lockwood, Geohazards Consultants International. The members of the panel were uniform in describing the academic benefits of PISCES to the Big Island and to UH Hilo. There was some caution voiced about sensitivity to the local community (see a more complete discussion of this in the following section on the Local Perspectives Panel), but the overall tone was extremely positive.

The audience was told that UH Hilo, although a small undergraduate school, supports academic growth in areas related to PISCES and that the administration will do what it can to create a positive environment in which the center can grow. A new science and technology building is being built, and UH Hilo is growing rapidly. Although it was not mentioned by the panel members, the UH Hilo Chancellor includes the establishment of a College of Engineering in her long-range plans for the campus. UH Hilo currently has about 85 majors in physics or astronomy and is developing a 0.9 meter instructional telescope which should increase that number.

LOCAL COMMUNITY PERSPECTIVE PANEL

This panel was also chaired by Dr. Fox, and included Robert Lindsey, an elected member of the Board of Trustees of the Office of Hawaiian Affairs; Barbara Hastings, President-elect of the Hawai'i Island Chamber of Commerce; Mark McGuffie, Executive Director of the Hawai'i Island Economic Development Board and Steve Durst, President of Space-Age Publishing Company.

All four participants tended to reinforce each other as they presented basically the same message, which was that the Island of Hawai'i is an excellent location for PISCES if members of the local business, ethnic, and residential communities are included in its planning from the very beginning. All of them agreed that PISCES represented a great opportunity in terms of jobs, education and economics for the Big Island and predicted that there would be a lot of support for PISCES. At the same time, all of them encouraged PISCES to be sensitive to the unique nature of the Big Island and to avoid the impression that it was coming from the outside to tell local people what to do. A number of anecdotes about what not to do were shared, the most significant being NASA's decision, which was ultimately unsuccessful, to go ahead with its so-called "Outrigger" construction in the face of local opposition. None of these was presented in a negative light, but served to provide a framework within which PISCES can be successful.

OPEN DISCUSSION

This was the wrap-up session of the conference, in which issues, possible solutions and next steps were discussed. The session was chaired by Frank Schowengerdt. The discussion revolved around several common themes: the recurring theme of the need for a cultural advisory board, which must include mostly native Hawaiians; the need for more specificity about what PISCES plans to do and where it will do it; the need for more clarity on what PISCES is, or will become; and the need for greater involvement from Japan and other countries.

Specific comments, as recorded by PISCES team member Rob Carlson in the order in which they were made, included the following:

1. Strongly suggest that PISCES have a "cultural liaison" that has a strong sensitivity to issues on the mountain. This should be combined with people having geological and lunar knowledge. Native Hawaiians must be involved.
2. Kim Binsted (UH Manoa) expressed an interest in including PISCES in her presentations to students (about her MARS experiences). PISCES should have people in Hawaii be integrally involved – natives also.
3. NASA people can come for an extra day when coming here to talk with students. At the same time it would be helpful for the "NASA" people to put together presentations or other materials that can be used after they leave.
4. Hawaiians do not like being used – want to be involved in the process, but used as symbols of PISCES support.

5. Do not use specific names (or photos) of the mountains in materials. If “Mauna Kea” is used it will link us with the astronomers. Need to have a standard “position” of how to express our message. This message should be developed with input from the locals – not taking them a “finished” product and asking for their review/comments.
6. There is not enough clarity about what PISCES is (or will be) for anybody to talk in anything more than generalities. This needs to be developed more fully before we move out (such as site selection).
7. Form a user advisory group. Chuck Lauer is to lead this team.
8. Suggest having a Centennial Challenge event to coincide with the PISCES conference next year and to coincide with NASA’s testing. Use this as an opportunity to develop logistics capabilities (such as mobile “workshops”).
9. The answer to “what is PISCES” is not clear to many people. Is it a single location or multiple sites? This misunderstanding needs to be addressed. Its definition needs to be clearer – at a one-page white paper level, not a mission or vision statement.
10. Until the sites are known, it is not possible to know if those sites are the best ones to use for specific applications.
11. Interested in a dirty thermal vacuum chamber. (Bill Larson)
12. The original PISCES proposal needs to be put on the website.
13. First thing that needs to be done is to develop relations with the local community.
14. It is not possible to “map” the mountains about where activities can take place and where they cannot take place.
15. Would like to see more involvement from Japan. Want to know what types of information JAXA wants / needs, so that PISCES can help address their issues.
16. Need an operating plan and also an organization chart asap!
17. One user indicated that the lack of pre-determined sites would cause him to not use PISCES, since he does not want to take the risk of having the local community reject usage of a desired site.
18. Need to make sure that the local community understands what PISCES is and what is in it for them.

CLOSING BANQUET AND TALK BY NAINOA THOMPSON

The conference closed with a banquet at the Imiloa Astronomy Center. The after-dinner talk was given by Nainoa Thompson, noted voyager and founder of the Polynesian Voyaging Society. Nainoa was introduced by UHH Chancellor Rose Tseng. He recounted his many voyages throughout the Pacific Ocean, which retraced the voyages of the early Polynesians and the routes followed in the settlement of the Hawaiian Islands.

CONCLUSIONS

Based on all comments received to date, this first PISCES conference was a huge success. It met all expectations and goals the organizers set for it in providing an opportunity for the local community, potential users and all stakeholders to gain firsthand knowledge of PISCES and help shape its future for the maximum benefit of the people of the Big Island, the State of Hawai'i and the world. The conference will continue to be held annually, if not as a separate stand-alone conference, at least as a part of the JUSTSAP symposium. The current plan is for the 2008 PISCES conference to be held on the Big Island in conjunction with JUSTSAP. The conference organizers wish to express our deep gratitude to the speakers and audience for their valuable participation, and especially to the UH Hilo Conference Center for keeping the conference running smoothly and making it a most pleasant experience for all concerned. The organizing team members are listed in the appendix, along with the members of the conference center.

Respectfully Submitted,

Frank Schowengerdt
Director of PISCES

APPENDIX

PISCES TEAM AND CONFERENCE ORGANIZERS

Dr. Frank Schowengerdt, Director: Affiliate Professor of Physics and Astronomy, University of Hawai'i at Hilo, President, SpacePartnerships.com, Alexandria, VA. (schoweng@hawaii.edu)

Dr. Robert Fox, Deputy Director, UHH Liaison, Higher Education Programs: Chair, Department of Physics and Astronomy, University of Hawaii at Hilo, (rfox@hawaii.edu)

Dr. Ken Hon, Geological Studies for Site Selection and Development: Chair, Geology Dept., University of Hawai'i at Hilo, (kenhon@hawaii.edu)

Judith Fox-Goldstein, Director, University of Hawai'i at Hilo Conference Center. PISCES Conference Director, (foxgolds@hawaii.edu)

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Dan Bland, Industrial and JSC Constellation Systems Liaison: President, Japan Manned Space Systems Corporation, America (JAMSS-America), (dbland@jamssamerica.com)

Rob Carlson, Industrial Liaison: JAMSS-America, (carlson@jamssamerica.com)

Dr. Mike Duke, ISRU and Higher Education Programs: Former Director, Center for Space Resources, Colorado School of Mines, Former Program Manager, NASA's Planetary Geosciences Program, Johnson Space Center, (mikeduke@earthlink.net)

Mark Henley, Site Assessment and Selection: Program Manager, The Boeing Company, (mark.w.henley@boeing.com)

Dr. Neville Marzwell, Robotic Testing: Technical Manager, Jet Propulsion Laboratory, California Institute of Technology, (Neville.I.Marzwell@jpl.nasa.gov)

Beth McKnight, Public Education and Outreach: President, McKnight Communications (beth@mcknightcommunications.com)

Dr. Osamu Odawara, JAXA and Japan Liaison: Professor, Tokyo Institute of Technology, (odawara@materia.titech.ac.jp)

Stephen Day, JUSTSAP Liaison: President, International Ventures Associates, (SSDAY1@aol.com)

UH HILO CONFERENCE CENTER PERSONNEL ASSIGNED TO PISCES CONFERENCE

Judith Fox-Goldstein, Director

Mary Ann Tsuchiyama, Conference Coordinator

Diana Kelley, Assistant Conference Coordinator

PISCES CONFERENCE AGENDA

Wednesday, Nov. 7

5:00 p.m. – 8:00 p.m. Registration

7:00 p.m. – 9:00 p.m. Opening Reception

Thursday, Nov. 8

7:30 a.m. - 8:15 a.m. Breakfast Buffet

7:30 a.m. - 4:30 p.m. Registration

8:30 a.m. Plenary Session

Oli (Opening Chant) by Mailelalani Canario

Words of Welcome

Robert Fox, PISCES Deputy Director, presiding

Randy Hirokawa, Dean of College of Arts and Sciences

University of Hawai`i at Hilo On behalf of Rose Y. Tseng, Chancellor University of Hawai`i at Hilo

Jim Crisafulli, Director State of Hawai`i Office of Aerospace Development

Mark McGuffie, Executive Director Hawai`i Island Economic Development

Board Stephen Day, Chairman Japan - US Science, Technology & Space

Applications Program

8:55 a.m. Introduction to PISCES Frank Schowengerdt, PISCES Director

9:30 a.m. Keynote Address: The Honorable James “Duke” Aiona Lt. Governor of the State of Hawai`i

10:00 a.m. Break

10:15 a.m. PISCES Users Panel Frank Schowengerdt presiding

NASA’s Analog Program, Doug Craig, NASA Headquarters

JAXA’s Manned Exploration Program, Naoki Sato, JAXA

NASA’s ISRU Requirements, Jerry Sanders, NASA Johnson Space Center

NASA’s Robotics/EVA Requirements, Terry Fong, NASA Ames Research Center

U.S. Industry Participation, Larry Clark, Lockheed - Martin

U.S. University Participation, Kim Binsted, University of Hawai`i at Manoa

Japanese Industry Participation, Spicy Hasegawa, JAMSS

Japanese University Participation, Osamu Odawara, Tokyo Institute of Technology

Lunch, Guest Speaker: Jane Poynter, Partner - Paragon Space Development Corporation and Crew Member - Biosphere II

1:30 p.m. Development Breakout Groups

Planning Progress Reports by Members of PISCES Team

Site Selection, Mark Henley, Boeing Company

ISRU, Mike Duke, Colorado School of Mines

Robotics, Neville Marzwell, NASA Jet Propulsion Laboratory

Business Plan, Dan Bland, JAMSS America

Education and Outreach, Beth McKnight, McKnight Communications

3:00 p.m. Break

3:15 p.m. Development Breakout Groups - (continued)

4:30 p.m. Student Design Presentations, Robert Fox presiding

6:30 p.m. Student Awards Banquet, Frank Schowengerdt presiding
Presentation by Mike Duke, Colorado School of Mines

Friday, Nov. 9

7:30 a.m. - 8:15 a.m. Breakfast

8:30 a.m. Reports from Development Breakout Groups

Site Selection, Mark Henley

ISRU, Mike Duke

Robotics, Neville Marzwell

Business Plan, Dan Bland

Education and Outreach, Beth McKnight

9:45 a.m. General Discussion of PISCES Development Plans

10:15 a.m. Break

10:30 a.m. Local Government Perspectives, Jim Crisafulli presiding

Administration:

Theodore Liu, Director DBEDT

State Legislature:

The Honorable Will Espero, Senator

The Honorable Clift Tsuji, Representative

The Honorable Gene Ward, Representative

County of Hawai'i:

The Honorable Harry Kim, Mayor of the County of Hawai'i

Lunch

Guest Speaker: Mino Dastoor, Innovative Partnerships Program, NASA Headquarters

1:30 p.m. Local Academic Perspectives, Robert Fox presiding

Randy Hirokawa, Dean of the UH Hilo College of Arts and Sciences

Larry Gray, President of the student Astrophysics Club

Philip Castille, UH Hilo Vice Chancellor for Academic Affairs

Christian Viellet, Director of the Canada-France-Hawai'i Telescope

John Lockwood, Geohazards Consultants International. AGENDA

- 2:30 p.m. Local Community Perspectives, Robert Fox presiding
Robert Lindsey, Hawai`i Island Trustee, Office of Hawaiian Affairs
Mark McGuffie, Executive Director, Hawai`i Island Economic Development Board
Barbara Hastings, President - Elect, Hawai`i Island Chamber of Commerce
Steve Durst, President, Space Age Publishing Company
- 3:30 p.m. Break
- 3:45 p.m. Open Discussion: Potential Issues/Possible Solutions and Next Steps.
Frank Schowengerdt and Robert Fox presiding
- 6:00 p.m. Dinner, Imiloa Caf 
- 7:30 p.m. Presentation `Imiloa Planetarium: Nainoa Thompson, President, Polynesian Voyaging Society

PISCES CONFERENCE REGISTRATION LIST

Last name	First Name	Affiliation
Aoki	Shigeru	Shimizu Corporation
Battler	Melissa	University of New Brunswick
Beals	David	NASA Langley Research Center
Binsted	Kim	ICS Dept, UH Manoa
Bland	Dan	JAMSS America, Inc.
Boucher	Dale	NORCAT Inc.
Brandhorst	Henry	Space Research Institute
Braun	Chris	Guest
Carlson	Robert	JAMSS America, Inc.
Clark	David	Lockheed Martin
Clearwater	Yvonne	NASA Ames Research Center
Comstock	Douglas	NASA
Craig	Douglas	NASA
Crisafulli	Jim	Office of Aerospace Development/State of Hawaii
Dastoor	Minoo	NASA
Davenport	Leon	Office of the Lt. Governor
Davis	Bruce	University of Colorado
Day	Stephen	International Ventures Associates, LTD.
DeLuna	Alan	United Space Alliance
Doyon	Michel	Canadian Space Agency
Duke	Michael	PISCES advisory committee
Duncan	Joel	Colorado School of Mines
Durst	Steve	ILOA / Space Age
Elliott	Joshua	Colorado School of Mines
Espero	William	Hawaii State Senate
Fong	Terrence	Ames Research Center
Fox	Robert	PISCES
Geiger	Joseph	Colorado School of Mines
Hasegawa	Yoichi	Japan Manned Space Systems (JAMSS)
Henley	Mark	Boeing
Henninger	Donald	NASA
Holderman	Carol	Honolulu Community College
Hon	Ken	UH-Hilo Natural Sciences Div.
Howell	Joe	NASA/MSFC
Ignatiev	Alex	University of Houston
Johnson	Braden	Colorado School of Mines
Jones	Zachary	Colorado School of Mines
Kea	Robert	Honolulu Community College

Kirk	Lianne	Honolulu Community College
Klaus	David	University of Colorado
Knecht	Robert	Colorado School of Mines
Kreutzberg	Rebecca	Colorado School of Mines
Larson	William	NASA
Lauer	Charles	Rocketplane Global, Inc.
Le Pape	Marc	University of Hawaii at Manoa
Liu	Theodore	DEBDT, State of Hawai'i
Lockwood	John	Geohazards Consultants International
Madden	Doug	Honolulu Community College
Marzwell	Neville	NASA - JPL
Matanane	Mateo	Honolulu Community College
McCarthy	Dane	Honolulu Community College
McGuffie	Mark	Hawai'i Island Economic Development Board
McKnight	Elizabeth	PISCES
Metts	Jonathan	University of Colorado at Boulder
Mueller	Robert (Rob)	NASA
Nall	Mark	Marshall Space Flight Center
Norrgran	Cynthia	Colorado School of Mines
Odawara	Osamu	Tokyo Institute of Technology
Onuki	Misuzu	Rocketplane Global, Inc.
Pangell	Cassidy	Colorado School of Mines
Poynter	Jane	Paragon Space Development Corp.
Puducay	Harold	Honolulu Community College
Rasky	Daniel	NASA Ames
Richard	James	Electric Vehicle Controllers Ltd.
Rosenbaum	Bernard	NASA- JSC
Sanders	Gerald	NASA Johnson Space center
Sato	Naoki	JAXA
Savely	Robert	JSC
Schowengerdt	Frank	University of Hawaii at Hilo
Sigurdson	Leanne	NORCAT
Silliman	Mark	Honolulu Community College
Simon	Tom	NASA Johnson Space Center
Smith	Jennifer	Honolulu Community College
Smith	Kristin	Colorado School of Mines
Solomone	Stacey	US Navy
Takata	Ronald	Honolulu Community College
Takeharu	Tsuge	Tokyo Institute of Technology
Van Treese	Kaylie	Colorado School of Mines
Veillet	Christian	Canada-France-Hawaii Telescope
Vong	Nguyen	Honolulu Community College

Ward	Gene	House of Representatives-Hawaii
Ward	Elizabeth	Christopher Newport University, NASA Langley Research Center
Wilks	Rodney	ATK
Yoshida	Tetsuji	Shimizu Corporation
Zavaleta	Jhony	NASA (KIPR)
Zhou	Weijia	Wisconsin Center for Space Automation and Robotics