FOR IMMEDIATE RELEASE **January, 17, 2006**

CONTACT: **MARTI TOWNSEND, Save UH / Stop UARC Coalition**
TELEPHONE: **(808) 372-1314**

ASTRONOMY PROJECT "BAILS OUT" OF UARC

According to a recently obtained University of Hawai'i (UH) document, the PanSTARRS Program, a major research endeavor of the Institute for Astronomy will not be a part of the University Affiliated Research Center (UARC), contrary to what was originally stated in the UARC proposal submitted by UH officials and approved by the Navy.

A November 17, 2005 letter from UH Manoa Vice Chancellor for Research and Graduate Education Gary Ostrander to Institute for Astronomy Director Rolf-Peter Kudritski states "PanSTARRS is NOT a part of the proposed University Affiliated Research Center (UARC) nor will the project undertake any form of classified research."

This represents a significant reversal. Every version of the UARC proposal to date, including the Technical Proposal that was basis for the Navy's acceptance of the UARC, highlighted the PanSTARRS program "to demonstrate the University's excellence and achievement in astronomical research."

"It looks as if the Institute for Astronomy finally realized that the UARC endangered their programs and decided to bail out," said Kyle Kajihiro, Program Director for the American Friends Service Committee - Hawai'i.

This is the second major science program originally slated for inclusion in the UARC that has demanded to be removed from the plan.

In 2003, UH physicists John Madey and Eric Szarmes struggled with UH administrators and Navy officials to have their ground breaking research with Free Electron Lasers removed from the UARC proposal. In the early 1980s, Madey invented the Free Electron Laser, a revolutionary technology that allowed researchers for the first time to adjust the frequency of lasers. Madey and Szarmes felt that the UARC would be detrimental to their research.

The last minute change also raises concerns about the integrity of the Navy's procurement process.

"It is extremely suspicious that the Navy would allow UH to casually and unilaterally make such a major change to the proposal after supposedly going through a rigorous process to justify the need," said Kajihiro.

"It proves that this UARC was never 'essential' to the Navy, and throws the legality of the UARC procurement process into doubt."

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UNIVERSITY OF HAWAI'I AT MĀNOA

GARY K. OSTRANDER, Ph.D.
VICE CHANCELLOR FOR RESEARCH
AND GRADUATE EDUCATION
E-Mail: gko@hawaii.edu

November 17, 2005

Dr. Rolf-Peter Kudritzki, Director
Institute for Astronomy
2680 Woodalwn Drive
Honolulu, HI 96822

RE: Panoramic Survey Telescope and Rapid Response System (Pan-STARRS)

Dear Dr. Kudritzki:

I write this letter with the intent that it be included in the Environmental Impact Statement for the PanSTARRS project so as to state publicly that PanSTARRS is NOT part of the proposed University Affiliated Research Center (UARC) nor will the project undertake any form of classified research.

In February 2005, the University of Hawai'i at Manoa, Applied Research Laboratory (UHM/ARL) submitted a proposal to the U.S. Naval Seas Systems Command (NAVSEA) in response to NAVSEA RFP N0024-05-R-6234 (S) for consideration to establish the University as a University Affiliated Research Center (UARC) under the authority of this Office. In its proposal, the UHM/ARL highlighted four core competencies to emphasize the technical achievements and programs of the University and to demonstrate its ability to conduct fundamental and applied research; engineering design and development; and to provide technical support to NAVSEA. One of the four core competencies outlined in the proposal was in the academic discipline of astronomical research.

To demonstrate the University's excellence and achievement in astronomical research, the proposal underscored the importance of the Pan-STARRS program, which is a primary research initiative of the Institute for Astronomy (IfA) and whose focal purpose is to detect and characterize Earth-approach objects, asteroids, and comets that pose a danger to the Earth. The proposal further iterated the goals, objectives, and intent of Pan-STARRS and cited that one of the task elements that could be achieved in astronomical research as a UARC included "monitoring near-Earth objects and exploiting the Pan-STARRS data product."

However, based upon the counsel and communication that transpired between this Office and yours on October 26, 2005, this letter acknowledges and affirms that the research objectives of Pan-STARRS are **not** affiliated with any type of classified research nor intended by the IfA to be associated with any other military or UARC initiative. Any previous citation or publication as to the role and intent of Pan-STARRS that is contrary to this announcement is inaccurate.

Sincerely,

Gary K. Ostrander, Ph.D.

c: David McClain, Interim President
Denise Eby Konan, Interim Chancellor
Kathy Cutshaw, Acting Vice Chancellor for Administration, Finance, and Operations
James R. Gaines, Vice President for Research
Sam Callejo, Vice President for Administration
Nainoa Thompson, Special Advisor to the President on Hawaiian Affairs
Carolyn Tanaka, Associate Vice President for External Affairs and University Relations

University of Hawai'i at Mānoa

Department of Physics and Astronomy
Watanabe Hall • 2505 Correa Road
Honolulu, Hawai'i 96822
Telephone: (808)956-7087 • Fax: (808)956-7107

4 August 2003

Professor Peter Englert,
Chancellor,
University of Hawai'i

Dear Prof. Englert:

We sincerely appreciated the opportunity to meet with you last Wednesday, July 30, to discuss the concerns which led us to request that our research not be considered for inclusion in the proposed Navy-sponsored University Affiliated Research Center (UARC).

One other concern regarding the development of the plans for a UARC, which we did not review at our meeting, was the need to preserve and strengthen the diversity of the research enterprise here at UH by insuring that the interests and authority of the many independent sponsors of that research are not compromised through the establishment of the proposed Center. This issue appears to be at least as important as our concerns regarding restrictions on intellectual property and on teaming with private industry which we discussed with you at the meeting.

We have prepared the attached letter to address this issue in a fashion that we hope will be helpful to you and your staff.

Sincerely,

John M. J. Madey,
Professor, Physics and Astronomy,
University of Hawai'i Manoa

Eric B. Szarmes,
Assoc. Professor, Physics and Astronomy,
University of Hawai'i Manoa

With respect to the ability to attract and retain qualified faculty, it is clearly also important to realize that many senior faculty at UH and elsewhere have entered into long-term relationships with the sponsors who have elected to fund their efforts as fundamental components of their missions. All successful University research enterprises must recognize this reality. The perception or possibility that the research enterprise at UH may be incapable of supporting these diverse and long-term relationships would surely be an important factor for any faculty members considering UH as a place to pursue their own interests and those of their sponsors.

The inclusion of a substantial number of non-Navy research programs in the draft management plan for the proposed Navy-sponsored University Affiliated Research Center (UARC) suggests that consideration is being given at some level to the coordination of these programs either as a component of, or in support of, the proposed Center. If that is the case, we believe it to be critical that this aspect of the proposed Center be carefully reviewed with respect to the interests and authority of the Government sponsors and UH faculty responsible for this non-Navy research. We are concerned that failure to address these issues could jeopardize many components of the University's non-Navy Federally funded research efforts.

The critical issues here are the authority for the management of UH's non-Navy research programs, and the lines of communications between the sponsors and performers of those programs. While the Navy is clearly best-qualified to manage the research programs here at UH which support its designated missions, it is also certain that the Navy has neither the knowledge or the authority to manage the research programs of interest to UH's other Federal sponsors.

We trust that anyone with any doubts regarding this conclusion will take cognizance of the very costly errors made by the Navy in its attempt to determine the ownership and disposition of the MkIII FEL, a system developed under contract to the Department of Energy's Los Alamos National Laboratory and the Army Space and Missile Defense Command. In the absence of technical awareness, programmatic responsibility and contractual authority, the ONR grossly erred in every significant finding, producing a report that has had grave repercussions for the interests of the United States, the sponsoring agencies, and Hawai'i.

Though we and others have offered many speculations regarding the Navy's motives for its report, in the end the Navy's behavior probably requires nothing more by way of explanation than that Navy was looking after what it believed to be its own best interests and had no obligation, assigned or implicit, to protect the interests of the non-Navy and non-DoD sponsors or owners of the research program that led to the development of the MkIII FEL, or to insure that the MkIII FEL was available to support those continuing interests.

Numerous other examples of the Navy's focus on its own interests to the detriment of the interests of other defense and civilian agencies are known to the research community, though perhaps none nearly so costly as the ONR's "findings" re the MkIII FEL.

Given this understanding of the critical role of the organizations that sponsor UH's many diverse research programs, we trust that you and your staff will give full and appropriate weight to the interests of these sponsors, and of the UH faculty they support, while pursuing the opportunities for development of a Navy-sponsored UARC here at UH.

Sincerely,

John M. J. Madey,
Professor, Physics and Astronomy,
University of Hawai'i Manoa

Eric B. Szarmes,
Assoc. Professor, Physics and Astronomy,
University of Hawai'i Manoa

UNIVERSITY OF HAWAI'I AT MĀNOA

PETER ENGLERT
CHANCELLOR

July 18, 2003

MEMORANDUM

TO: John M.J. Madey
Professor, Physics & Astronomy

FROM: Peter Englert
Chancellor

SUBJECT: UARC Draft Management Plan

Thank your for your remarks and comments on the UARC Draft Management Plan. I have requested that Vassilis Syrmos, who is the UHM point of contact for UARC initiative, correct any inaccuracies and erroneous statements that were pointed out in your letter dated July 16, 2003. Please be assured that we will prepare a revised Management Plan that addresses all the necessary corrections, and the revised plan will be sent to you for your review. I will personally communicate your concerns to Admiral Cohen and the NAVSEA UARC Office during my visit to the Office of Naval Research in August, 2003. Thank you for you input in this matter.

c: Gary Jensen
Vassilis Syrmos

FACSIMILE COVER PAGE

16 July 2003

TO:	PETER ENGLERT
	CHANCELLOR'S OFFICE
FX:	956-2751

FROM:	JOHN MADEY, ERIC SZARMES
	DEPT. OF PHYSICS
FX:	956-5907

TOTAL PAGES: 6

Dear Chancellor,

We would appreciate your assistance in addressing the issues we have described in the attached letter.

Sincerely,
John Madey,
Eric Szarmes

University of Hawai'i at Mānoa

Department of Physics and Astronomy
Watanabe Hall • 2505 Correa Road
Honolulu, Hawai'i 96822
Telephone: (808)956-7087 • Fax: (808)956-7107

16 July 2003

Professor Peter Englert,
Chancellor,
University of Hawai'i

Dear Prof. Englert:

This is to request that immediate action be taken to correct a series of grave errors in the text of the "Management Plan" for the proposed Navy-sponsored University Affiliated Research Center (UARC) forwarded to Admiral Cohen under your signature on 16 April 2003 (copy attached), as well as in all other documents or correspondence in which these errors have been propagated.

The representations cited in the attachments explicitly and erroneously state that the AHI Sensors Project is a Navy research program, and that the AHI Sensors Project presently in progress here at UH under Army sponsorship represents a critical Navy "core competence".

These assertions are not merely erroneous, but could be fatal to the future of our research by conveying the impression to our DoD and DoE sponsors and supporters that the University's real purpose in promoting the AHI Sensors Project is not to support the specific research objectives stipulated by our present contractual obligations, but rather to serve an entirely different program to be conducted for the special benefit of the Navy.

There is no question in our minds that, should these documents be conveyed in any form to our sponsors and supporters at the Department of Energy and the Army Space and Missile Defense Command, the resulting confusion as to the University's true objectives and commitments with respect to the AHI Sensors Project and the use of the MkIII FEL MOPA system would be fatal to our research.

The Department of Energy has, in particular, been rigorous in its insistence that they justify the transfer of the MkIII FEL MOPA system to Hawai'i only on the basis of its use for the DoE's research programs here in Hawai'i, and we have worked extensively with our DoE funded colleagues here at UH to fulfill this requirement by insuring that the equipment will serve their special purposes here at UH as well as our own. Accordingly, when the MkIII FEL MOPA system finally arrives here at UH, it will be assigned to the High Energy Physics group's DoE grant, with title and the contractual authority to determine its use remaining with the Department of Energy.

For these reasons, we respectfully request that you take whatever steps are required to correct the misstatements regarding the sponsorship and objectives of our research. In addition, we request that we be provided with copies of whatever correspondence is forwarded to the Navy and others re this matter so that we can assure our sponsors and supporters that appropriate action has been taken to correct these obviously erroneous and unintended statements.

We sincerely appreciate the assistance and support you have lent to us since your arrival at Manoa, and deeply regret any inconvenience that this may cause you. Please let us know if there is anything we can do to help.

Thank you for your prompt and immediate attention to this urgent matter.

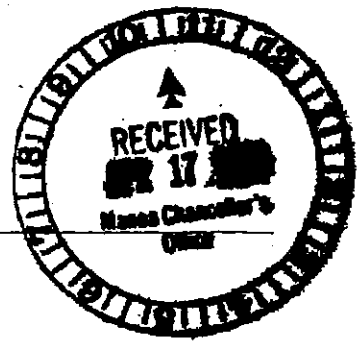
Sincerely,

John M. J. Madey,
Professor, Physics and Astronomy,
University of Hawai'i Manoa

Eric B. Szarmes,
Assoc. Professor, Physics and Astronomy,
University of Hawai'i Manoa

Attachments:
1. 16 April 2003 cover letter
2. Erroneous Representations

xc: Jennifer Goto-Sabas
Charlie Houy
Ted Liu
W. F. Chen
Vassilis Syrmos



UNIVERSITY OF HAWAI'I AT MĀNOA

OFFICE OF THE CHANCELLOR

April 16, 2003

Admiral Jay M. Cohen
Chief of Naval Research
800 North Quincy Street, Suite 907
Arlington, VA 22217-5660

Dear Admiral Cohen:

Please find enclosed the University of Hawai'i's proposed University Affiliated Research Center (UARC) management plan for submission to be sponsored by the Office of Naval Research (ONR) and managed by Naval Sea Systems (NAVSEA). We would appreciate it if you would forward our management plan and the University of Hawai'i's DOD funding for Years 2000-02 to Admiral Balisle of the Naval Sea Systems. Mr. David Sivillo, Deputy Director, University Laboratory Management Office of NAVSEA has been our point of contact.

The Chancellor's Office at the University of Hawai'i at Mānoa and the Office of the Executive Director of the Research Corporation of the University of Hawai'i are in the process of briefing other DOD agencies about our University Affiliated Research Center submission.

Thank you for this opportunity and your support towards establishing a UARC at the University of Hawai'i.

Sincerely yours,

Peter Englert
Chancellor

Enclosure

c: Dr. Evan Dobelle, President, University of Hawai'i
Mr. Harold Masumoto, Executive Director of RCUH
Dr. David McClain, Interim Vice President for Research
Dr. Rolf Kudritzki, Interim Vice Chancellor for Research and Graduate Education
Mr. Gary Jensen, Director, ONR, Mid-Pacific
Ms. Mun Fenton, Technical Director, ONR, Mid-Pacific

2500 CAMPUS ROAD • HAWAI'I HALL • HONOLULU, HAWAI'I 96822 • TEL (808) 956-7837 • FAX (808) 956-2751

Attachment:

ERRONEOUS REPRESENTATIONS
in the
UNIVERSITY OF HAWAII UNIVERSITY AFFILIATED RESEARCH CENTER (UARC)
MANAGEMENT PLAN

"UNIVERSITY OF HAWAII AT MANOA
Applied Research Laboratory (ARL)
University Affiliated Research Center (UARC) Core Statement

"MISSION

"The University of Hawaii (UH) proposes to establish an Applied Research Laboratory (ARL), a University Affiliated Research Center (UARC), ***under the auspices of the United States Navy*** to be a premier Mid-Pacific based technical research, development, test and evaluation (RDT&E) organization. The ARL will be conducting research in the areas of: ... ***(c) Advanced Electro-Optics and Sensing (AEOS)***; ... ***(g) Weaponized Laser Technology (WLT)***. **[p. 1]**
...

"SCOPE

"The UH unique capabilities pertinent to the UARC's core competencies include:
...

"**College of Engineering**: ... The College of Engineering also is renowned for its advanced research programs ***in LASER remote sensing*** and passive IR remote sensing. ...**[p. 5]**

"**Specific College of Engineering programs include**:
...
"5. LASER Remote Sensing Group. The LASER Remote Sensing Group is actively engaged in several projects for ONR and other government agencies.
...
"***c. The group currently supports a Free Electron Laser project, sponsored by the Army Space and Missile Defense Command (SMDC) the goal of which is detection of dilute nuclear species for the NTPO office.*** (Footnote 1) **[p. 6]**
...

"CORE COMPETENCIES

"The University of Hawaii UARC provides the following core competencies in research, development and engineering *of Navy programs*. (Footnote 2) ...**[p. 8]**

...

"Advanced Electro-Optics and Sensing (AEOS)

"The College of Engineering has proven capability in several disciplines ...The core competencies in AEOS include:

...

"2. Multi-Wavelength LIDAR Imaging

...

"*c. Free electron LASER detection of dilute nuclear species* (Footnote 3) ...**[p. 10]**

...

"*Weaponized Laser Technology (WLT)* **[p. 11]**

"The Marine Environment Weapons Test Laboratory at PMRF for testing of advanced LASER technologies in a marine environment. DoD funding is not listed for this competency because it is listed in other sections under individual projects, e.g., funding for LIDAR measurement of marine boundary layer aerosols and water vapor fields is included in AEOS Competency 2; ***Multi-wavelength LIDAR Imaging***." (Footnote 4) **[p. 12]**

Footnotes:

1. The free-electron laser project sponsored by SMDC (the AHI Sensors project) is not in the College of Engineering, and none of its collaborators is a member of that College. The Navy has made no contribution to the support of this program.

2. The "Free electron LASER detection" program cited on p. 10 is not a Navy program.

3. The free-electron laser project sponsored by SMDC (the AHI Sensors project) is not in the College of Engineering, and is not a Navy program.

4. None of the projects cited under "Multi-Wavelength LIDAR Imaging" on p. 10 is a Navy Weaponized Laser Technology (WLT) project, including the "Free electron LASER detection" program cited on p. 10.

From: *Neuberger Thomas J NSSC <NeubergerTJ@NAVSEA.NAVY.MIL>*
Date: *September 26, 2003 12:05:00 PM HST*
To: *"'madey@hawaii.edu'" <madey@hawaii.edu>*
Cc: *Sivillo David N NSSC <SivilloDN@NAVSEA.NAVY.MIL>, bill.andre@smdc.army.mil*
Subject: RE: UHM UARC

John,

Please be assured that I was never trying to "include" your research efforts in the UHM UARC initiative. We were approached by representatives from CNR and UHM, including ADM Cohen, Dr. Syrmos and Chancellor Englert, and asked to help establish a Navy-sponsored UARC at UHM. We are the only Navy office with experience in UARC administration -- that's how we got involved. However, we are not a UH program/funding sponsor, and by ourselves we cannot justify a UHM UARC to the Navy/DoD acquisition executives who must approve it. So we are trying to reach out to all other DoD program funding offices which may be interested in a long-term UARC relationship with UHM, to determine what their interest is, and whether a UHM UARC case can be made based on DoD requirements. To help identify sponsor contacts and support the case for a UHM UARC, I asked Dr. Syrmos for a list of all DoD funded work within the past several years. He provided this list a number of months ago. Your programs are on this list, but that probably occurred before the internal UH agreement to exclude your programs. Until now, I did not know that. I am sure Dr. Syrmos felt he had covered this matter by insuring that your programs where not specifically reflected in the draft core statement, which is all he needed to do.

Part of our data gathering strategy is that DoD sponsors who have worked with UH in the recent past would be a good source of information, and some of them may want to support the UHM UARC initiative for the future. We need a substantial base of DoD sponsor support to make the case for a UHM UARC, and we are literally trying to build that base in response to this request from the Chief of Naval Research (copy attached FYI).

The shortcoming in our strategy of calling all recent UH DoD sponsors is that we never anticipated researchers within UH would seek exclusion from the UARC initiative. We have never seen that before, and I still wish I knew why, although I agree you don't have to tell me.

Sorry for the misunderstanding.

Sincerely,
Tom Neuberger

Volume I
Technical Proposal

Applied Research Laboratory
University of Hawaii at Manoa

ARL/UHM TECHNICAL PROPOSAL SUMMARY

Previous fundamental research, funded through competitively awarded grants, has formed the basis for a strong underpinning of UHM's support to the Navy. The focus of this research is on understanding the physical processes in the ocean environment with a particular emphasis on the Pacific region and applying core expertise in other designated areas. The ARL/UHM will enhance this focus and facilitate the continued close strategic partnering with Navy/DoD which is critical to solving system-related problems in the core areas of the ARL. UHM has demonstrated the ability to interpret and transition basic and applied research from academia to the Department of Defense (DoD). Over the past four decades UHM has performed scientific and engineering investigations in core disciplines for a diverse range of organizations including federal, state and local governments. Additionally, the Pacific region and Hawaii in particular are unique in their geographic strategic importance to DoD. The location and climate coupled with multiple unique facilities, like the Maui Space Surveillance facility, Pacific Missile Range Facility, and the Maui High Performance Computing Center, allow for an almost unlimited scope of investigative research activities. The School of Ocean and Earth Science and Technology (SOEST) on-going research programs include autonomous underwater vehicles development test and evaluation, biosonar and cetacean echolocation and the effects of manmade noise sources in the ocean, bathymetry, mapping and modeling and tropical atmospherics and oceanography. The Institute for Astronomy is a world renowned astronomical research center and includes the largest DoD telescope, the 3.67 meter Advanced electro Optical System. Ongoing astronomical investigations include a program for the discovery and characterization of Earth-approaching objects, detector programs and adaptive optic research and instrumentation. Hawaii's College of Engineering continues to be a leader in the development of communication and computer networks and in development and testing of C4I systems, sensor hardware and signal processing algorithms. Additionally the college is renowned for its advanced research programs in LASER remote sensing and passive IR remote sensing.

ARL/UHM proposes to perform fundamental and applied research, engineering design and development, and technical support to the Navy in the areas listed below:

(1) We propose basic and applied research, and systems development, integration, test and evaluation, in the areas of ocean environmental effects and the interaction of natural and man made underwater noise sources on Littoral Anti-Submarine Warfare (ASW), marine life, mammals, and other Naval experiments. Other associated competencies have been developed in bathymetry, autonomous underwater vehicles, acoustic mapping and littoral topography, buried mine detection, advanced sonar and biosonar signal processing, and tropical atmospherics and oceanography.

(2) We propose astronomical research and applied engineering utilizing existing unique facilities and laboratories and development of world-class state of the art optics and sensors for defense applications. This research has been applied to advanced satellite tracking systems, development of adaptive optics, space observations coordination such as the Hubble Space Telescope and the Pan-STARRS program to detect and characterize Earth-approaching objects, asteroids and comets that may pose a danger to earth.

(3) We propose to develop, test and improve advanced electro optical systems, detectors, arrays and instrumentation. This competency had been applied to virtually all the astronomical research as well as other electro-optic devices including LIDAR, photonics, and other laser technologies.

(4) We propose research and applied engineering supporting improvements in the utilization of various regions of the electromagnetic spectrum, advancements in communications, networks and protocols, Command Control Communications Computer and Intelligence (C4I) systems hardware and signal processing. This capability has been applied to advanced radar technology, distributed processing, sensor network integration, design tradeoff studies especially in the areas of RF arrays, passive remote sensing, command and control integration and wave propagation.

Astronomy (AST)

The Institute for Astronomy (IfA) is one of the world's leading astronomical research centers. We propose fundamental and applied research in the studies of the sun, planets, and stars, as well as interstellar matter, galaxies, and cosmology. In addition to doing research, we propose to do design and build new instruments to measure and analyze the radiation collected by the telescopes. The Maui Space Surveillance System (MSSS) is a state-of-the-art electro-optical facility combining operational satellite tracking facilities with a research and development facility, the only one of its kind in the world. The MSSS houses the largest telescope in the Department of Defense, the 3.67-meter Advanced Electro Optical System (AEOS), as well as several other telescopes ranging from 0.4 to 1.6 meters.

Broad Objective:

We propose to undertake a range of fundamental and applied astronomical research objectives and to support these objectives by utilizing the unique staff, facilities and laboratories of the Institute for Astronomy to develop new, state of the art instrumentation and observational capabilities. This research is broadly focused on:

- Understanding the Sun and its many interactions with the Earth.
- Characterizing the atmosphere and its effects on optical signal propagation.
- Developing advanced adaptive optical elements
- Monitoring near-Earth objects
- Exploiting the Pan-STARRS data product for maximum scientific return
- Developing new instrument and focal plane architectures.
- Advancing the state of hyper-contrast, circumstellar imaging instruments.

Core Competencies:

The Institute for Astronomy (IfA) is the core astronomical research facility of the University of Hawaii. It is a university research institute with a staff of over 180 including more than 50 faculty and post-doctoral scholars. IfA operates facilities on the islands of Oahu, Hawaii, and Maui. IfA facilities include offices, shops, computer facilities, classrooms and libraries. The IfA is highly ranked as an international research entity in astronomy and has incubated many active research programs that have significantly improved astronomical and instrumental infrastructure. Many

have close ties to industrial partners and are generally supported by NSF, NASA and DOD. Supporting IfA are significant companion capabilities including:

- Design, development and fabrication of instruments of all types from spectrographs to coronagraphic cameras.
- Modeling and characterizing the atmosphere and atmospheric propagation
- Soft and hardware support for the manipulation and analysis of large data sets.
- Shops, test facilities and a strong technical support staff.
- Design and operation of wide-field survey telescopes.
- Massive mosaic focal planes and novel detectors and detector arrays.
- Design and fabrication of state-of-the-art, high speed array controllers.
- Curvature adaptive optics systems.
- High dynamic range imaging systems
- Polarimetric instruments.
- Signal processing software and user interfaces.

Task Elements:

A. Solar Research: The Sun is important to us for many reasons. It is the closest example of a star we can study and its radiation is the source of almost all life on Earth. It already affects crops, communications and weather on Earth but the full range of Solar-Terrestrial interactions are just beginning to be understood. Specific research objective with respect to the Sun include:

- High precision imaging Stokes polarimetry of the solar corona at 1-4 microns.
- High spectral resolution dual beam echelle polarimetry of the solar corona.
- Development of atmospheric remote sensing technology using astronomical scintillation sources.

B. Atmospheric Characterization: All optical/infrared observations from ground-based telescopes are fundamentally limited by critical atmospheric parameters: atmospheric transparency, sky brightness and turbulence arising from variations in the index of refraction along the line of sight. The success of techniques to overcome atmospheric effects is strongly determined by our own understanding of the distribution of the

optical turbulence along the line of sight, and the speed of at which that turbulence changes. Specifically we need to understand:

(1) The mechanical mixing of the atmosphere above the site. The physics of turbulence in the free atmosphere is fairly well understood and with the advent of high-speed computing facilities, we are now beginning to model and predict the strength and location of optical turbulence in the free atmosphere and boundary layer. These models however are in their infancy and need a dataset of optical turbulence measurements for calibration.

(2) The effects of locally induced temperature variations (e.g. telescope/dome
eddies). Although this has been recognized for some time as a major source of image degradation it has been only recently that modeling of flows in and around telescope enclosures and monitoring of the temperature variations within the observatory have been done. Again, the models are qualitatively correct but more homogeneously taken data to quantify the results.

(3) Surface layer turbulence arising from ground winds and a warm/cold ground layer and boundary layer turbulence arising from local topographic features at the site. This is the least understood regime of optical turbulence. This layer typically accounts for 60-80% of the total optical turbulence at a site but what gives rise to this turbulence and its evolution are just now being studied. The local topography is important but on scales from meters to kilometers. For example, there is evidence of stability waves oscillating between mountain peaks giving rise to waves of optical turbulence above a site. These waves can extend from 100's of meters to many kilometers into the free atmosphere.

While instrumental campaigns have addresses each of these issues interpreting the data within the context of a complete turbulence profile is often very difficult because only part of the profile is being observed or only integrated quantities are being measured. We propose to characterize atmospheric turbulence with an complete facility that can simultaneously address the entire profile. Such a facility would include:

- an integrated optical turbulence monitor (Seeing Monitor)
- an optical turbulence low-res monitor (MASS)
- a high-resolution optical turbulence instrument (G-SCIDAR)
- an optical turbulence wave front outer-scale monitor (G-GSM)
- a set of 2-3 high-resolution low-altitude turbulence monitor (e.g. Scanning scintillometer (SPM), Lunar SHABAR, or SLODAR)
- an all-sky/wide field photometric camera with measuring in multiple wavelengths.
- a set of basic weather stations for distributed around the site

C. Adaptive Optical Elements. Over the last decade the IfA has been developing a new type of adaptive wavefront corrector based on a wave front sensor invented at the IfA by Francois Roddier. This system measures and corrects wave front curvature and is now in use in many facilities around the world. Curvature-based adaptive optics (AO) systems are very efficient compared to traditional approaches and require far fewer elements to achieve a high level of correction. IfA is currently commissioning the largest curvature system built to date which allows an eight meter diameter telescope to be corrected to 80% of ideal at a wavelength of 2 microns with just 85 correcting elements. The system can work with guide stars as faint as 16-17 mag. Curvature adaptive systems hold great promise for the future but have not as yet been anywhere near fully exploited because there is very little active research on component development and on gaining a theoretical understanding how curvature systems work. IfA will undertake significant efforts in both areas and research will focus on:

- Characterizing and using new piezoactive materials like single crystal materials and their application to curvature AO systems.
- Development of high order curvature components and systems with more than 500 correction channels.
- Development of large lightweight deformable elements for wave front control.
- Development of powered adaptive elements.
- Evaluation of low noise detectors and detector arrays for wave front sensing.
- Development of low-cost, modest performance curvature adaptive systems for general improvement to the national observational infrastructure.

D. Monitoring near-Earth objects and exploiting the Pan-STARRS data product. Earth has been hit many times by asteroids and comets whose orbits bring them into the inner solar system. These objects, collectively known as Near Earth Objects or NEOs, still pose a danger to Earth today. Depending on the size of the impacting object, such a collision can cause massive damage on local to global scales. There is little doubt that sometime in the future Earth could suffer another cosmic impact. That such cosmic collisions can still occur today was demonstrated graphically in 1994 when Comet Shoemaker-Levy 9 broke apart and 21 fragments, some as large as 2 km in diameter, crashed into the atmosphere of Jupiter. If these fragments had impacted on Earth instead, we would have

suffered global catastrophes of the kind that inspire science fiction movies.

In 1994 the House Committee on Science and Technology directed NASA, in coordination with the DOD, to work with the space agencies of other countries to identify & catalogue within 10 years the orbital characteristics of all comets and asteroids larger than 1 km in orbits that cross the orbit of the Earth. Several programs have been undertaken to map the orbits of large NEOs that might pose a danger to Earth. Pan-STARRS is designed to complete the survey of all 1-km diameter objects, and to detect most of the dangerous objects down to 300 meters in diameter -- objects that can cause major regional catastrophes should they hit the Earth.

Pan-STARRS uses four comparatively inexpensive 1.8-meter-diameter telescopes each designed to have a 3.5-degree field of view to make a nightly survey of the sky to very faint magnitudes. Each telescope is fitted with a massive 109-pixel CCD array being developed. The survey will have 3-16 times the collecting power of the current NEO survey telescopes that will reach objects 100 times fainter than those currently observed by the NEO surveys. Further, Pan-STARRS' large field of view, 7 deg2 per exposure) is larger than that of any of the current NEO survey programs. This allows observing the sky faster and more frequently. Finally, Pan-STARRS will have higher spatial resolution than existing survey systems, allowing observation where the ecliptic plane overlaps with the Milky Way, often too crowded with stars for the current surveys to observe effectively.

Backing up the observational component will be a powerful computing environment that will process the observations, calibrate the astrometric and photometric (position and brightness) properties of individual observations, and detect the "moving" objects such as asteroids, comets, and Trans-neptunian objects (TNOs). The system will also track all objects already known (or discovered by itself), so that on future nights when an object is re-observed it can be rapidly identified and its orbit updated to include the new data. There are currently about 100,000 known moving objects in our solar system that are tracked by professional astronomers. With Pan-STARRS, we estimate that we will catalog up to 10 million main-belt asteroids and tens of thousands of NEOs and TNOs. The problem of processing the 3,000 Gigabytes of data that will be collected every night will is being addressed in collaboration with the Maui High Performance Computing Center.

The massive Pan-STARRS data stream can be used for much more that the project primary goals and it is essential that efficient and maximal use are made of the data. Secondary data products include:

- Solar System Science. Discovery and characterization of outer solar system object asteroid and Kuiper belt objects.
- Stars and the Galaxy: Massive stellar catalog of the Northern sky with the discovery of many variable stars and micro-lensing events
- Discovery of massive extrasolar planets by occultation
- Discovery of many transient events such as those associated with both young and old stars as well as phenomena like gamma ray bursts and active galactive nuclii.
- Understanding the large scale structure of the universe by looking at galaxy distributions and gravitational lensing events

In addition to the astronomical data product Pan-STARRS will also produce significant atmospheric data including large angle tilt correlations, transparency distribution and integrated turbulence distribution.

E. Instrument and Focal Plane Technologies. The Pan-STARRS effort is just part of IfA's ongoing detector development program. Chips are produced in collaboration with several electro-optical companies but the IfA is specialized in adapting detectors to special application like a new, high speed 2KX2K 1-2.5 micron array, an 8K, visible Mosaic camera, infrared arrays for the JWST, and "orthogonal transfer" CCDs that allow images to be shifted rapidly on the array while being exposed. This allows image motion compensation that can be done much more rapidly than with a traditional tip-tilt mirror.

We propose to continue these efforts as well as extending our detector research into new areas like photon counting arrays for wave front sensing and a high dynamic range infrared demodulating imaging detector.

IfA designs and builds a wide array of instruments in addition to those built specifically for adaptive optics. Projects include a spectrograph being built for the 3.67-meter AEOS telescope operated by the Air Force on Haleakala, Maui, the UH-Wide Field Imager will use the UH 8K CCD camera, Infrared Camera and Spectrograph (IRCS) for the Suabaru eight-meter telescope, Solar-C – a half-meter, off-axis, low scatter reflecting telescope designed to allow unprecedented Solar coronal observations and Near Infrared Imager (NIRI) - an imaging instrument for the 8-meter Gemini Telescope. In addition all NASA Infrared

Telescope Facility instruments are built at the IfA, which also staffs and hosts the facility.

We recognize that progress in instrumentation goes hand in hand with progress in science and we propose to develop a suite of new generation instruments keyed to many of the scientific objectives discussed above. Many of these instruments like those for solar observing and atmospheric characterization have already been discussed but we are also developing new approaches to other problems. One of the most demanding of these problems is that of hyper-contrast imaging; detecting faint objects in the immediate neighborhood of bright ones. While this is strictly speaking and an instrumental problem it is also intimately coupled to the optical system, the adaptive corrector and many other factors. Efficiency and the control of scattered light are critical to this problem and we are working to develop both high order adaptive systems and a new approach to generating image cubes to support this effort. Because the high dynamic range imaging problem is so intimately related to the gross optical system we are proposing to upgrade the IRTF to become a test bed both for adaptive optics and new hyper-contrast instruments.

Potential Sponsors:

NAVSEA, NAVAIR, ONR, DARPA, NRL, MDA, AFOSR, AFRL, ARO, ARL, NASA.

DISCUSSION PAPER

Subject: Requirements and Process for establishing a new University Affiliated Research Center (UARC), in support of Defense RDT&E.

Purpose: During the past several years, a small but increasing number of Universities have expressed interest in the possibility of establishing a UARC. This paper discusses the intent of "UARC", and an approach for establishing a new UARC.

Background: UARCs are awarded non-competitive DoD contracts through a provision of the Competition in Contracting Act (CICA) of 1984, as codified in 10 U.S.C. 2304(c)(3)(B), which authorizes non-competitive contracts with educational institutions where necessary for DoD to establish or maintain essential engineering, research and development capabilities. UARCs support DoD through a special "Strategic Relationship," wherein they serve as trusted technical advisors free from commercial conflicts of interest. The requirement for maintaining a UARC and its associated funding is driven by the specific needs of sponsoring DoD RDT&E programs. There is no guaranteed or minimum DoD funding associated with a UARC.

At the request of Congress, DoD developed and issued a UARC Management Plan in 1995. At that time DoD sponsored 7 UARCs, which were originally established to support specific DoD RDT&E needs. The resources of these seven UARCs have been dedicated primarily to Defense programs for many years (the four Navy-sponsored UARCS have been focused on Defense programs for 60 years). The DoD UARC Management Plan established criteria for utilization and oversight of UARCs, as a business model to ensure appropriate utilization of the CICA exception to competition for major university laboratories supporting DoD.

By Congressional mandate a university laboratory, which annually receives more than $10M for work on DoD RDT&E programs through the CICA exception, is subject to the requirements of the DoD UARC Management Plan. The UARC Management Plan does not apply to Defense Research performed by Universities which is: (1) awarded through a competitive process such as Broad Agency Announcements (BAAs); (2) awarded non-competitively under other CICA exceptions, such as "only one responsible source" (10 U.S.C. 2304(c)(1)), or "required by statute" (10 U.S.C. 2304(c)(5), e.g. earmarked funding); and (3) subject to 10 U.S.C. 2304(c)(3)(B), but falls below the $10M threshold. While Congress set the threshold at $10M, above which UARC requirements are mandatory, OSD policy permits UARC designation for funding levels as low as $2M annually. Hence, long-term funding in the $2M to $10M range makes UARC designation optional.

Designation of a University Laboratory as a UARC imposes additional responsibilities on the University and its DoD sponsors to comply with the requirements of the Management Plan, but it does not provide any guaranteed funding levels. The requirement for a UARC must be driven by a long term DoD need for an RDT&E capability which embodies the "strategic relationship" concept defined in the Management Plan, especially the need for a trusted technical agent free from commercial interests. Such capabilities may be achieved through Defense Laboratories, UARCs or FFRDCs. Universities that perform Defense Research through contracts or grants awarded outside of 10 U.S.C. 2304(c)(3)(B) are not designated as UARCs, and seeking such

designation would invite unwanted oversight. UARC designation does not generate sponsorship and associated funding. Sponsorship comes first, driven by Defense programs needs. A UARC may be, where appropriate, the business model for meeting a long-term DoD need. The determination to establish a new UARC is therefore internal to DoD, independent of a University's potential desire to establish a UARC.

Since the inception of the UARC Management Plan in 1995, DoD has established two additional UARCs, and a third UARC is in process. In each case, the new UARC satisfies a specialized Defense technical need that was not available among the established Defense Laboratories, UARCs or FFRDCs. In the case of the Army's need for a UARC with core capabilities to perform research on soldier nanotechnology, a competitive process was used for the initial UARC selection. Fourteen proposals were received and award was made to MIT. NSA is undergoing a similar competitive process to establish a UARC to help meet its long-term requirements related to linguistics technology. In each of these cases, the need was driven by DoD program sponsors, not by a University desire to establish a UARC.

Discussion: This discussion outlines a recommended approach for creating a new UARC. First, the need for a new UARC should be established by a major DoD RDT&E program sponsor, or group of sponsors, to meet long-term R&D requirements which cannot be reasonably accomplished by the commercial sector. The sponsor(s) should look first to the established base of Defense Laboratories, UARCs and FFRDCs to meet this need. Where insufficient capabilities exist among the existing organizations, a new UARC relationship may be considered.

The sponsor(s) must define the long-term requirement (with funding expected to exceed $10M annually), in the context of the core capabilities to be maintained by the UARC. These required capabilities must be approved through the Service Acquisition Executive (SAE) and forwarded to the Director of Defense Research and Engineering (DDR&E) for final approval to establish a new UARC. The sponsors should then solicit proposals from all interested Universities for establishing a new UARC to meet the approved core capability requirements. The selection process should follow established procurement procedures. Since the contract award is made competitively, 10 U.S.C. 2304(c)(3)(B) and the UARC Management Plan do not apply to the initiation of the university laboratory.

During a start-up period, perhaps up to five years, the university should develop the required core capabilities through performance of DoD sponsored R&D. During this period, the university laboratory should embrace the principles of the UARC Management Plan in anticipation of a follow-on UARC contract awarded under 10 U.S.C. 2304(c)(3)(B). Near the end of the start-up period, the primary DoD sponsor should conduct a comprehensive review, consistent with the DoD UARC Management Plan, to evaluate the success of the laboratory and determine whether there is a continued long-term need for a UARC relationship. A report of the comprehensive review should be submitted through the SAE to DDR&E for approval. If approved, the sponsor may then initiate a non-competitive UARC procurement under authority of 10 U.S.C. 2304(c)(3)(B), and requirements of the Management Plan become mandatory after award of the follow-on contract. Thereafter, the primary DoD sponsor should conduct a comprehensive review every five years as required by the UARC Management Plan.

When a decision is made to establish a UARC, the parent university must recognize and agree to a set of obligations that differ from standard contract or grant agreements with Universities. Among these obligations are limitations on work conducted for commercial enterprise to avoid potential conflicts of interest, real or perceived. UARCs are also prohibited from competing with industry in response to DoD solicitations for certain types of developmental work. Because DoD UARCs often work with classified information, they must meet all the requirements for secure handling of such information. There are also restrictions on release of sensitive but unclassified scientific and technical information to the public. These obligations subject UARCs to increased physical and cyber security oversight by DoD sponsors, and limitations on open academic collaboration and publication of research material. An additional obligation in the form of investment is expected from Universities that operate UARCs. The long-term strategic relationship is built upon long-term, stable employment of a highly skilled workforce that is granted access to sensitive government and private contractor technical information. Specialized facilities and equipment necessary to conduct the research and development needed by government sponsors are also required. Investments by the University in personnel, facilities, and equipment are essential to developing and maintaining the strategic relationship. UARCs are rarely provided with government-furnished facilities, and the University must commit to providing sufficient capital investment in both facilities and equipment to enable performance of DoD work.

Officials within DoD that sponsor UARCs, as well as university officials that manage them, have a joint responsibility to ensure that the principles for establishing and maintaining UARCs, as outlined in the UARC Management Plan, are upheld. The UARCs are a critically important asset to DoD, and careful stewardship is required to ensure that the authority for maintaining UARCs remains available for the long term. A proliferation of UARCs that are not well conceived or managed could eventually undermine DoD's ability to maintain it's longstanding, essential UARC relationships. The creation of new UARCs must therefore be limited to well-justified cases, and undertaken with considerable planning and care. Creation of UARCs to facilitate the contracting process, accommodate earmarked funding, or primarily to satisfy a University preference, are examples that will be viewed as abusive of the UARC authority and must be avoided.