Pan-STARRS & Weak Lensing

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What is Pan-STARRS?

- The Panoramic Survey Telescope and Rapid Response System
- Main Goals:
  - Near Earth Objects
  - Everything Else
- PS1: The prototype at Mount Haleakala
- PS4: The magnum opus at Mauna Kea
The only viable alternative for the Pan-STARRS project, which is currently being considered, is the Haleakalā High Altitude Observatory Site, on the Island of Maui. Aside from the summit of Mauna Kea, this is the only other location where the University of Hawai‘i has a site for ground-based observatories. At 10,000 feet elevation, Haleakalā is about one third of the earth’s atmosphere. While the typical “seeing” conditions for ground-based observations on Haleakalā are not as good as those experienced on Mauna Kea, the Maui site is among the premier locations in the northern hemisphere and the world. Though it is technically possible to conduct the Pan-STARRS survey at Haleakalā, it is expected to take nearly 20 years to complete because astronomical conditions are not as good as Mauna Kea.

Specifically, the Pan-STARRS project alternative site is proposed for the area including the existing PS1 facility and the previously developed Reber Circle. The Haleakalā site requires a configuration which adds three new instrument enclosures in the area near the Pan-STARRS prototype PS1 facility, as described in the Haleakalā High Altitude Observatory Site Long Range Development Plan (2005).
The summits of Mauna Kea and Haleakalā are known as the wao akua, the realms on earth that are the dwelling place of spiritual sources. In essence, the summits are spiritual realms that were and continue to be accessed by those individuals connected through successive genealogical ties to each respective summit for the purpose of inspiring, healing, guiding, teaching, and nurturing the needs of the people. Given their extensive knowledge of star alignments and celestial events, it was the traditional kilohoku that were viewed as key sources to adequately plan for daily life activities, the timing for handling governmental affairs, and for travel and navigation across the vast ocean. These acute skills of observation continue to be perpetuated in contemporary expressions of traditional cultural practices. As an approach to this planning process, any planned and desired activity at either summit has to be viewed and framed in this spiritual context and understanding.

Comparatively, according to the Merriam-Webster dictionary, the term "science" has its derived roots in the Latin term scientia which means "having knowledge" and is ascribed as being in the state of knowing. Astronomy is defined as the systematic accumulation of knowledge related to the study of objects and matter outside the earth’s atmosphere and of their physical and chemical properties. Some of the key questions that astronomers seek answers in the pursuit and quest for knowledge include some fundamental inquiries to understand the beginnings of our origins and to assess the future potential of our continued existence.
Who is Pan-STARRS?

• Core partners: IfA, MIT/LL, MHPCC, SAIC, UHH

• Science consortium: IfA, JHU, UK, NCU (Taiwan), MPE, MPIA, CfA, Princeton, Berkeley, Bonn, LCOGT
PS Features

- 1.8m telescopes
- 3 deg FOV
- 1.4 Gpix
- 64x64 Orthogonal Transfer CCDs at 600x600 pixels each
- 24mag in ~1 min
- Terabytes per night
- $3\pi$ survey in grizy 4x per year to 23-25 mag
- 3.5 yr lifetime
- Other specialized surveys
- PS4: full sky every month
PSI Key Projects

1. Inner solar system
2. Outer solar system
3. Stars
4. Exo-planets
5. Milky Way & Local Group
6. M31
7. SNae progenitors
8. Microlensing and SN Ia
9. Galaxies
10. AGN & high z Quasars
11. Cosmological lensing
12. Large scale structure
Pan-STARRS WL

- $3\pi$ sr of sky observed 4x per year in $grizy$ to 23-25 mag!
- All WL science from redshift 0 to 1
- Coordinated efforts with LSS, other groups
- Data not public
Pan-STARRS WL

PS1 WL Pipeline

- Data from IPP
- Shape analysis (UH,Ed,Bonn)
- Catalogues of estimated shear
- Photo-zs
- 3D estimated shear catalogues
- Other KP's (LSS, etc)
- Science output: Cosmological parameters, lens properties, reconstruction, etc
- Analysis tools
- Validation
- Simulated catalogues (Bonn, Dur, Ed, Heidelberg)
- Follow-up observations
PSI Status

• New secondary is installed
• Pushing hard on cable wrap, focal plane, ...
• Fully integrated camera and optics *literally any day now*
• Good progress being made on pipeline
Status
Summary

- Pan-STARRS is immediate and very promising
- Full-visible-sky lensing a possibility!
- Keep your eye out for first light