



Mauna Kea Synergies and Vision for Mauna Kea as Northern Hemisphere Astronomy Center

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July 23, 2013





The Vision of King David Kalakaua



Kalakaua hosted a British
Venus Transit expedition in
1874

He visited Lick Observatory in
1881

He wanted Hawaii to
participate in international
astronomy.



The Vision of Howard Ellis and Mitsuo Akiyama

Howard Ellis worked at the Mauna Loa Observatory in the early 1960's. He believed that both Mauna Loa and Mauna Kea would be ideal observatory sites. He talked to many people on Hawaii Island trying to generate interest in this idea. One of these people was **Mitsuo Akiyama**, executive secretary of the Hawaii Island Chamber of Commerce.

Following the devastating tsunami in 1960, Akiyama wrote to universities in the U.S. and in Japan asking them to evaluate Mauna Kea as an observatory site.

He received only one response – from **Gerard Kuiper** of the University of Arizona Lunar and Planetary Lab.



Gerard Kuiper & Governor Burns
Mauna Kea 1964





Site Testing on Pu`u Poliahu 1964





Governor John Burns' Vision

Governor John Burns recognized that Hawaii has
“some obvious advantages in this area of scientific
research” ...

and that Hawaii “must capitalize on these [natural
resources], utilizing all our available resources at the
University , in the industrial community and at the
levels of State and local government.” ...

“We can acquire competence in any field of scientific
inquiry. The limitations are only those we impose on
ourselves.”



The Mauna Kea Observatories



Institute for Astronomy

University of Hawaii



-TMT



-Keck



-IRTF

-Subaru



-SMA



-JCMT



-CSO



-UKIRT



-UH88



-Gemini



-CFHT





Key Features of the MKO

Location

- mid-ocean shield volcano, 14,000' 20° latitude
- near population centers and 2 international airports

Commercial Electric Power

Fiber Optics Communications Infrastructure

- 1 Gbit/s today – 10 Gbit/s very soon

County & State Lighting Ordinances

- require full shielding and control color

MK Weather Center

- custom forecasts of temp, wind, cloud, seeing



Synergy

Synergy is the interaction of multiple elements in a system to produce an effect different from or greater than the sum of their individual effects. The term synergy comes from the Greek word *synergia*, meaning “working together”



Synergies (I)

Scientific Programs

Larger telescopes extend the work of smaller ones, reaching to further distances, fainter limits, higher resolution

Smaller telescopes work as “pathfinders” for larger telescopes (e.g. Subaru HSC/PFS and TMT)



Synergies (II)

Shared Resources

Sharing resources among several observatories can provide substantial savings in operational costs.

Sharing can include personnel; technical expertise; facilities; equipment, etc.

Requires an appropriate level of collaboration or integration among the observatories involved.



Synergies (III)

Instrumentation

Modern astronomical instruments are far more capable, complex, and **expensive** than those of 30-40 years ago.

A competitive instrument can cost 20% or more of the cost of the telescope on which it is used – a **qualitative** change in relative cost.

Strategic collaborative planning so that instruments are not duplicated and are used as much as possible;
telescope specialization



Synergies (IV)

Coordinated Use of Sites

MK Comprehensive Management Plan allows only 1 new site – the one for TMT; all other future development is limited to refurbishment or replacement at existing sites (“recycling”)

Refurbishing or rebuilding at an existing site is awkward

Coordinated use of two or more sites alleviates this problem while also facilitating synergies II and III above.



Synergies (V)

Strength in Numbers

Collaborations in which the partners have adopted an agreed process for determining funding, staffing, instrumentation, etc. can often be more resilient in difficult times than single-entity organizations.



Synergies (VI)

The Not-for-Profits

Current Not-for-Profit MK Observatory Organizations

- Canada-France-Hawaii Telescope Corporation
- California Association for Research in Astronomy (Keck)
- Thirty Meter Telescope Corporation

Not-for-Profits typically have simpler administrative policies and procedures than other types of organizations.

Not-for-Profits can be flexible and can change membership relatively easily.



Future Vision

The Thirty Meter Telescope





Future Vision

The Thirty Meter Telescope

The arrival of the TMT will precipitate major changes among the other optical/IR facilities

Many of their scientific programs will be in support of or complementary to TMT programs

TMT partners will be looking for operational cost savings at their other facilities.



Future Vision

Keck I and II, Subaru, Gemini

Scientific Programs Aligned with TMT Programs

Shared Resources to Reduce Operational Costs

Strategic Instrumentation Planning

Expanded Partnerships



Future Vision

CFHT, UKIRT, IRTF, UH 2.2 m

Scientific Programs Aligned with TMT and 8-10 m's

New Partners or Mergers (e.g UKIRT)

Shared Resources to Reduce Operational Costs

Strategic Instrumentation Planning

Coordinated Use of these Sites

Replacement (Recycling) e.g. ngCFHT



Future Vision CSO, JCMT, SMA

Scientific Programs Complementary to or in Support of
ALMA Programs

New Partners or Mergers (e.g. JCMT)

CSO Expected to Close by 2018



Future Vision

Essential Infrastructure

We are living off the investments that were made 20-30 years ago!

Access Road

- repair existing paved portion
- pave lower half

Visitor Station > 100,000 visitors per year!

Electric Power Line – needs upgrade for TMT



Future Vision

Site Protection and Preservation

Must have adequate funding for proper mountain management and stewardship (OMKM)

Protection of natural and cultural resources

Protection of dark skies and freedom from radio frequency interference



Future Vision Pan-Pacific Observatory

A Federation of Pacific Rim Countries that would jointly operate a large number of the MK observatories.

The synergies described above would all apply.

Currently: USA, Canada, Japan, Australia, Chile, China, Taiwan, India, Korea

Could be created by mergers and/or accretion



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