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THE MAGELLAN PROJECT: A 6.5-M TELESCOPE AT LAS CAMPANAS

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RESUMEN

Se describen los detalles del telescopio de 6.5 metros del Proyecto Magallanes de la Carnegie Institution of Washington en el Observatorio Las Campanas.

ABSTRACT

The details of the 6.5 meter telescope of the Magellan Project of the Carnegie Institution of Washington at the Las Campanas Observatory are described.

Key words: **TELESCOPES**

The Magellan Project, aiming at the construction of a telescope of large aperture at Las Campanas, is the initiative of Carnegie Institution of Washington through its Department of Astronomy, The Observatories of the Carnegie Institution of Washington in order to remain astronomically competitive during the last decade of the XX Century and the beginning of the XXI Century.

Discussions about Magellan and its goals started at Carnegie as early as 1980 and it seems likely that the concept of an "optical Arecibo", an idea being developed further by the University of Texas nowadays, was born during these early discussions.

The outcome of the early discussions was an 8 meter telescope of new technology, whose partners other than the Carnegie Institution were Johns Hopkins University and University of Arizona. The loss of Johns Hopkins as a partner in 1991, forced the revision of the original project, leaving us today with the same telescope originally planned, scaled down to a diameter of 6.5-m, and preserving the primary mirror surface per astronomer. While this was not the original goal, the decision of scaling down is now considered the correct one and has allowed the project to continue with great momentum. The other alternative would have been to start looking for new partners at a time when projects were many and partners were scarce.

The telescope project aims at the full utilization of the capabilities of the site. Long-time experience in North-Central Chile of three large observatories and, in particular, a detailed analysis of a large data base concerning weather and seeing, is convincing and allows us to choose Las Campanas without second thoughts as the site for the Magellan Telescope. More specifically, three sites where analyzed within Las Campanas: The "ridge" next to the duPont telescope, the Manqui hill, North of the lodge and East of the telescopes and Las Campanas peak proper. The differences in seeing between the three sites is negligible and climate is identical between the ridge and Manqui, while being considerably windier at Las Campanas. With a median seeing close to 0.55 arcsec for Manqui and the ridge, Manqui was selected for its marginally better seeing and because in this way the operations of the existing telescopes will be affected least. The existing infrastructure in terms of roads, power, water, etc. will have to be somewhat expanded but it will, essentially be the same infrastructure that is being used now.

The new telescope will have to be capable of exploiting the very best conditions. This implies that sub-arcsecond seeing conditions will be the regular working condition and the telescope image should never become dominant. This does not only impose criteria on the telescope optics but also on the mechanical and thermal stability of the mirror, cell, telescope and, most important, on the thermal properties of the enclosure. All of these criteria are being discussed and revised periodically by the various teams working towards the Magellan Telescope.

MAGELLAN PROJECT

University of Arizona Carnegie Institution of Washingto

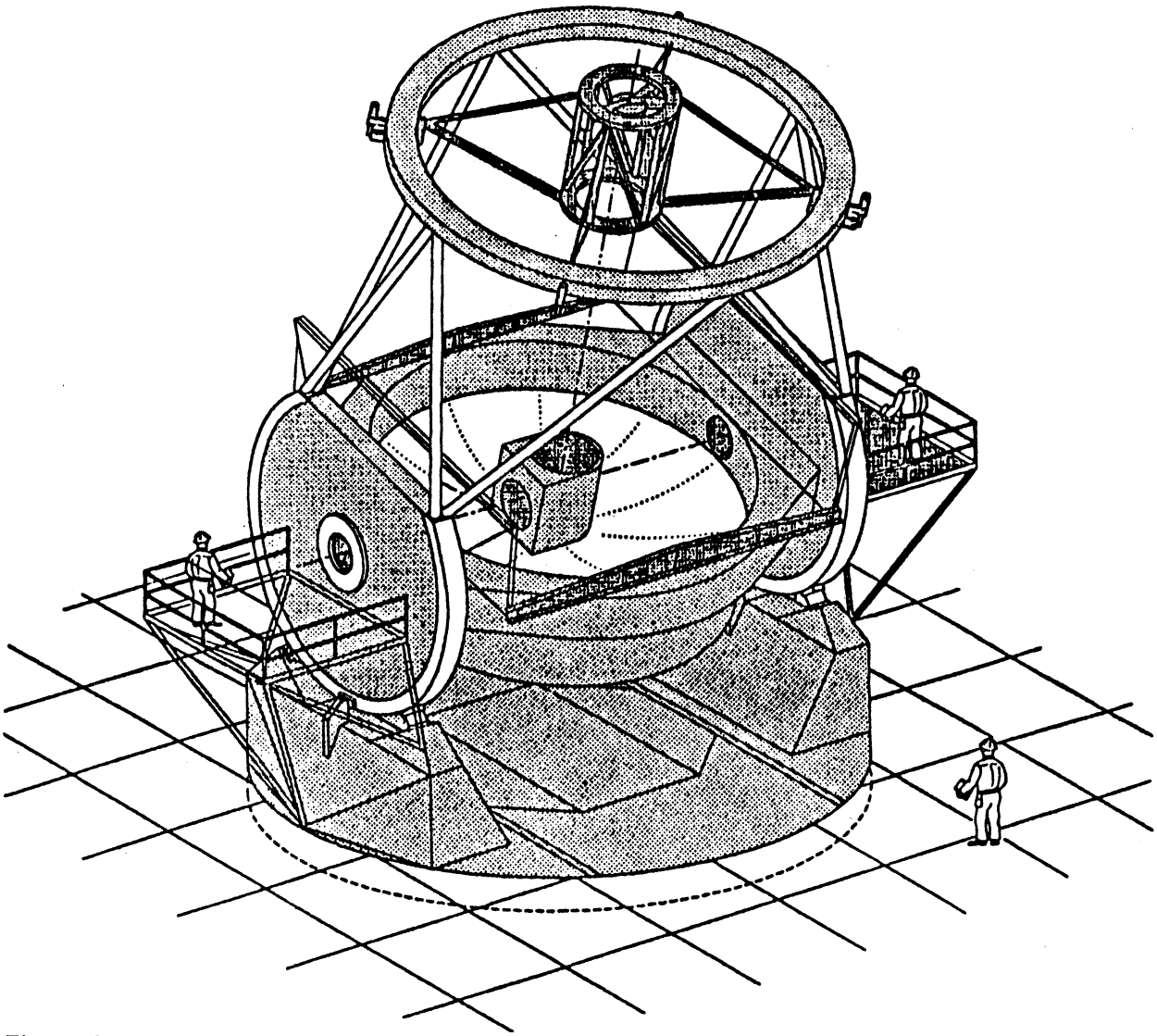

Fig. 1. Conceptual design of the Magellan 6.5-m telescope.

These are the main characteristics of the Telescope — Dome system:

MIRROR:
6.5 meter BOROSILICATE HONEYCOMB
provided by U. of Arizona. Very fast
f/ratio: 1.25, making the telescope
very short. Actively supported and
Thermally stabilized

OPTICS:

GREGORIAN with several Nasmyth foci. Final f/10 Gregorian f/ ratio. Requires a different secondary for near-infrared which can be flipped-in easily. Tip-Tilt adaptive secondary. Remote on-line focusing and collimation of secondary mirror. Far Infrared secondary requires change of upper structure.

MOUNT:

ALT. AZIMUTH.

DOME:

Light, octagonal structure with many openings. Removed from the ground, on "stilts" to allow air-flow under the observing floor.

Figures 1 and 2 show a first approach to what the telescope and dome will look like. Figure 3 shows that a 6.5 meter telescope would look like if the 4-m telescopes of NOAO were scaled. The differences and advantages of the new technologies of the large telescopes of the last years of the XXth Century are obvious.

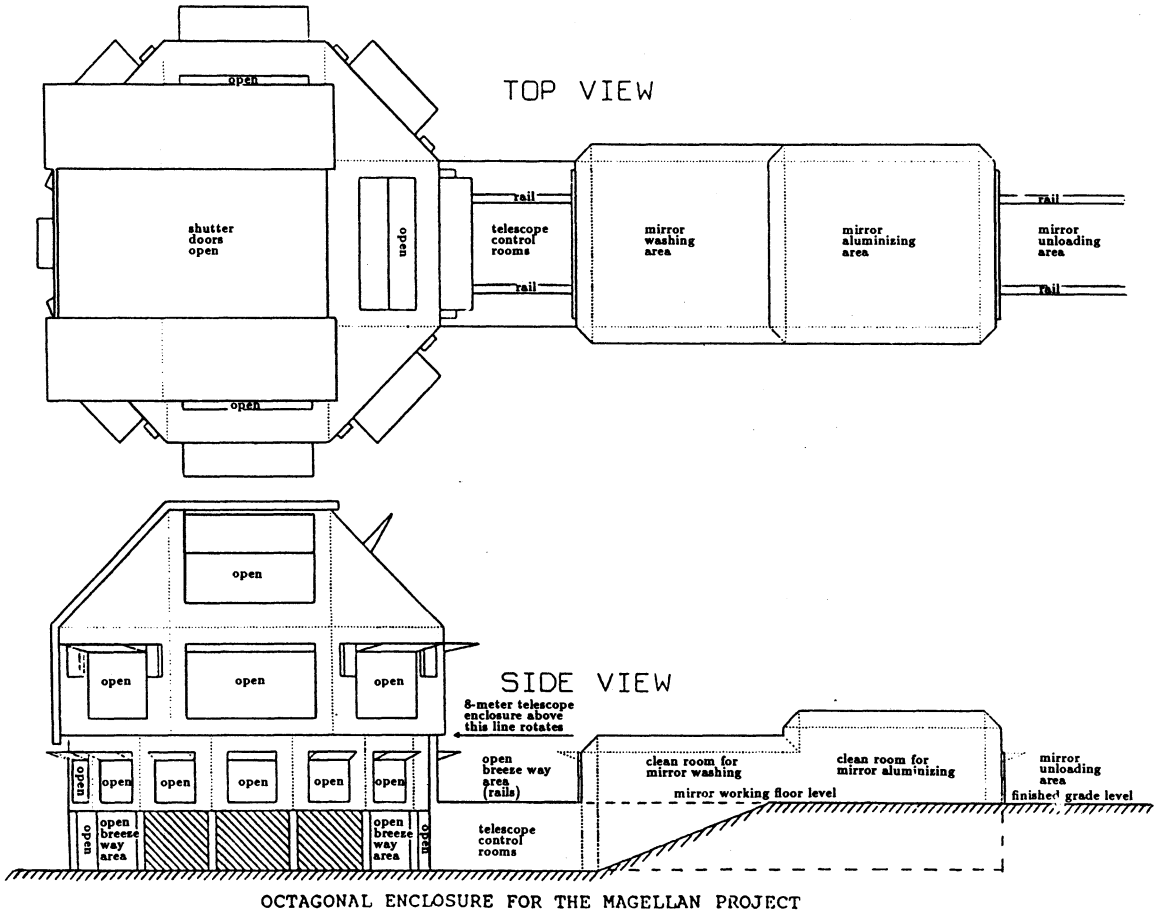

Fig. 2. Conceptual design of the enclosure for the telescope. Notice all the ports marked "OPEN". The auxiliary building to the right of the dome can be used for the same purposes for a second telescope placed to the right of the picture.

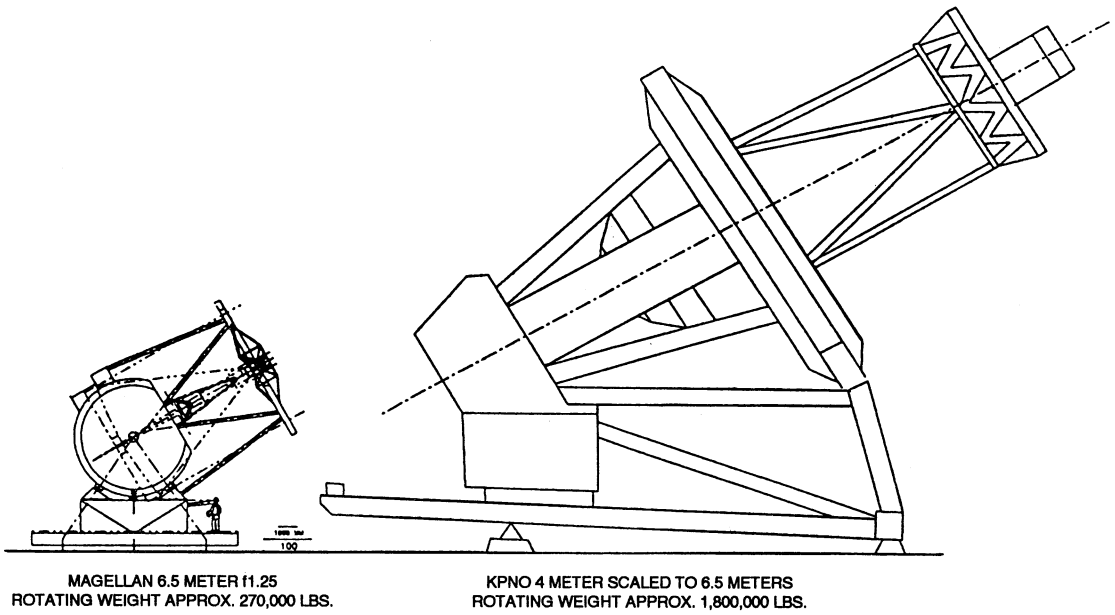

Fig. 3. Comparison of two 6.5 meter telescopes.

The estimated cost of the Telescope-Dome-Aluminizing facility is of the order of 30 million dollars.

The mechanics of the telescope and dome will be fabricated by L.&F. Industries of California.

The Gregorian design has been analyzed carefully. Imaging will most likely be performed by means of an imaging spectrograph, incorporating a corrector lens; this design yields the following results:

For a 24 arcmin field:
Polychromatic spot size is $\leq$ 0.5 arcsec but,

For a field $\leq$ 17 arcmin:
U–band images $\leq$ 0.23 arcsec
$B - I$ images $\leq$ 0.08 arcsec
IR images: will require a different secondary
and will not use the imaging spectrograph.
Images will be diffraction limited
Images will be always seeing-dominated.

The finite-element analysis of the mechanical structure of the telescope displays the lowest resonant frequency at 10 Hz.

Site-preparation work is currently under way. It has been decided to prepare the mountain top so as to accommodate two 6.5 meter Magellan class telescopes. The cost reduction of sharing a control area and aluminizing facility makes this a very attractive possibility. Talks analyzing the possibility of a second 6.5 meter mirror are currently under way with U. of Arizona.

Carnegie Institution of Washington is firmly committed to the Magellan project. At the time of writing the telescope is fully funded, the stage of detailed drawings has started, materials for the first 6.5 meter mirror have been purchased and delivered to the Mirror Lab, and a meeting of potential partners for a second 6.5 meter telescope will be held in the near future.

First light is expected towards the end of 1966.

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