

# 11. Management Structure: The Large Millimeter Telescope Observatory

## 11.1 The Large Millimeter Telescope Observatory

The LMT will be operated through the Large Millimeter Telescope Observatory (LMTO), a new entity formed jointly by UMass Amherst and INAOE and incorporated in Mexico as a non-profit Civil Association. Charged with the completion, commissioning, maintenance, and operation of the telescope facility, the LMTO will be governed by an Operative Board which will, for example, appoint a director and review and approve the director's annual budget and operating plan. In addition to his or her planning, budgetary, and operational duties, the director will hire and be responsible for the LMTO staff, which will include a senior telescope engineer, a site manager, a business office, and a small scientific, technical, and maintenance staff. As of 2005, Alfonso Serrano of INAOE has been chosen as interim LMTO director, and several senior LMTO staff members have been hired.

The LMTO Board will be advised by an external Scientific and Technical Advisory Committee (STAC), with members drawn from scientific institutions around the world. As has been the case during the design and construction of the telescope, the STAC will meet annually.

Table 11.1 Membership of the LMT Scientific and Technical Advisory Committee (STAC) as of 2004

<b>Member</b>	<b>Home Institution</b>
Paul Goldsmith, Chair	Cornell University, USA
Roger Hildebrand	University of Chicago, USA
Richard Hills	University of Cambridge, UK
Javier Jimenez Espriú	NEC, Mexico
Richard Kurz	European Southern Observatory
Arcadio Poveda	UNAM, Mexico
Luis Felipe Rodríguez	CRyA, Mexico
Nick Scoville	California Inst. Technology, USA
Gianni Tofani	Ist. Radioastronomia, Bologna, Italy

The LMTO director will be advised by a bi-national Science Team of astronomers and engineers from UMass Amherst and INAOE, which will develop plans for the in-house scientific program, future instrument development, and telescope upgrades. Instrument development will be the responsibility of the two partner institutions, rather than of the LMTO itself. Guest instruments will also be encouraged (see Chapter 12).



*Figure 11.1 Members of the STAC and the LMTO Science Working Group visiting the telescope site, with Cútlaltepetl (Pico de Orizaba) in the background.*

Observing time on the new telescope will be allocated between UMass Amherst and INAOE according to the contributions of each side toward the construction of the antenna and its instrumentation. It is expected that the final distribution of time will be fairly equal between the two partners. Observing time will be made available to the astronomical community at large, as discussed in Chapter 12.

## 11.2 Facilities

On the mountain there will, of course, be a control room and other normal facilities for running a major facility. However, because of the high altitude, it is planned that visiting observers and LMTO staff will normally not sleep at the site. In particular, once normal telescope operation begins, most astronomical observers will remain at lower altitudes—at the base camp, at INAOE, or ultimately at their home institutions observing via the Internet.

Consequently, the LMTO is developing a base camp at the foot of the mountain with a high bandwidth connection to the LMT. It will include an operational and computing center, machine and electronics shops, living and cooking facilities, storage and maintenance for vehicles, storage for equipment and supplies, a first aid station, and a Visitors' Center.

The principal LMTO offices and operational center will be located on the INAOE campus in Tonantzintla, on the outskirts of Puebla. A building has been completed for this purpose, where observing consoles and computing facilities will be available. There are also dormitories (bungalows) and a cafeteria. Of course, some visitors may prefer to stay in hotels in nearby Cholula, the oldest continuously inhabited city in North America and a religious and trading center for more than 2500 years, or in Puebla, a lovely colonial city with about two million inhabitants.

A U.S. Observing Center will be established at UMass Amherst, once truly remote observing is practical. This may be a convenient location for U.S. and some other observers.

### 11.3 Operating the LMT

The operations plan of an astronomical facility defines the degree to which the scientists participate in the collection and processing of their data. This planning also defines the roles and size of the technical support staff to maintain and develop an efficient system. Several operation models for telescopes have been developed and implemented at various facilities in recent years. For example, a static schedule model assigns an absolute date and time to a research program that is carried out by the astronomers or by the observatory staff in a service mode. Dynamic scheduling assigns time to projects according to scientific priorities and weather conditions to ensure that the most highly rated programs are completed. Each model has both advantages for and limitations to the missions and goals of an observatory that must be considered when defining the operations plan.

The LMTO has adopted an incremental plan for operation of the 50 m telescope. At first, all commissioning and initial scientific observations will take place with the observer located at the base camp following a specified schedule of observing programs. During these observations, the astronomers will be controlling the antenna and activating data collection programs with the LMT Monitor and Control System themselves, or through direct communication with telescope operators. Such direct interaction with the telescope system provides excellent educational opportunities and training for students, while minimizing operational judgment errors affected by high altitude. LMTO staff members will be present at the summit for safety and local monitoring of the weather conditions and instruments. The base camp will also provide eating and sleeping accommodations for the on-duty staff and visiting astronomers.

As the LMT system and communications link become more stable with time, the astronomers will be located on the INAOE campus in Tonantzintla or the U.S. observing center at UMass Amherst. The proximity of the observer to additional LMTO staff and experienced LMT users offers additional opportunities for consultation and scientific interactions. The initial LMTO operations plan does not preclude the ability to conduct



service observing in some instances or targets of opportunity programs, and it does not inhibit the development of tools for dynamic scheduling. Indeed, dynamic scheduling is the long-range goal of the LMTO, in order to maximize the scientific productivity of the facility, although this must necessarily follow several years of experience and operational understanding of the LMT system.



Figure 11.2 The 2500-year-old city of Cholula, with the volcano Popocatepetl in the background.

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