RevMexAA (Serie de Conferencias), **39**, 117–118 (2011)

SYMPOSIUM SUMMARY

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I congratulate you on this symposium entitled "Highlights of Boletín de los Observatorios de Tonantzintla y Tacubaya", which reviews the publication of the Tonantzintla Observatory that later gave way to its daughter organization INAOE, and the Observatory of Tacubaya of the Universidad Nacional Autónoma de México (UNAM) which later became the Instituto de Astronomía. I am impressed with the following things:

1. The large variety of research and its sophistication done by its astronomers despite limited equipment. These projects include searches with direct images and an objective prism for emission-line, peculiar, and luminous stars; photometry of variable stars and clusters; abundances in planetary nebulae and H II regions; theories of galactic formation and motions; and optical design.

2. The large amount of work: 174 papers in 21 years in the Boletín alone, done by a small and isolated staff.

3. The breadth of research done. It showed a remarkable foresight to foresee that the progress in 20th century astronomy will depend upon innovative telescope and instrument designs, electronic detectors, and computing techniques for data reduction and theoretical studies. That was the reason for combining astronomy, optics, electronics, and computing in one organization.

4. The Observatories have benefited from excellent directors who have not hesitated to expand, build, and provide the needed equipment within their limited budgets.

5. The Observatories have had a congenial staff and has not allowed a difficult person or two from interfering with progress.

The organizers have selected some of the best papers published in the 21 years of the Boletín. The speakers have explained why they were important and what happened to those fields since then. I do not intend to repeat in detail what they have said. However, I would like to add some overview.

It was an act of genius for Luis Enrique Erro and his colleagues to build a Schmidt telescope, rather than another kind. Other Schmidts were placed in poorer locations (Ohio, Michigan), farther from access to southern skies, and without an objective prism (Palomar). Astronomy was approaching a time in which we would study stars fainter than 10th mag. and many galaxies. But we did not know which objects to observe. The Astrographic Catalogs, BD, CD, and CPD were of little help for astrophysical work. The HD was one-dimensional and the Bright Star Catalogue was limited to 7th mag. Astronomy needed to know which of the billions of stars and galaxies we should study. So it was time for surveys such as the ones done at Tonantzintla. These surveys were carried out with great zeal by Guillermo Haro, Enrique Chavira, Braulio Iriarte, and the González sisters among others.

The Observatories brought in young astronomers from Caltech, UC Berkeley, and elsewhere who brought in knowledge and capabilities not available in Mexico.

I admire how Manuel Peimbert, Silvia Torres-Peimbert, Miriam Peña and their colleagues opened up the study of planetary nebulae and discussed the seemingly inconsistent data about them. Miriam Peña listed Manuel Peimbert's seven mechanisms for those differences. They and Manuel Méndez are trying to obtain valid abundances in planetaries and the Orion Nebula. With Crossley photoelectric measures they determined absolute fluxes and found no deviations from the normal reddening law.

I admire how Alejandro Cornejo and his colleagues developed needed testing methods for telescopic optics before computers were available and manufactured those optics.

I admire how Harold Johnson and Eugenio Mendoza worked to define standards and applied them to clusters and even to the Magellanic Clouds.

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I congratulate Christine Allen, Arcadio Poveda, and their colleagues on finding a logical solution to the seemingly impossible job of explaining the run-away and high-latitude stars.

Regarding the interesting topic of differences in extinction in different objects, Rafael Costero explained the history of extinction measures by Johnson & Mendoza that showed a different value in the Orion Nebula and NGC 2024, and Leonid Georgiev discussed Mendoza's application to the Magellanic Clouds.

Arellano Ferro started his history with photometry of 300 Cepheids by Richard Mitchell et al. that was used to determine galactic motions, the evolutionary status of Cepheids through period changes, and Fourier coefficients. Although later studies, including his own (Ferro et al. 1998) superseded that work, the Mitchell et al. study is still useful for deriving period changes.

José Peña reviewed the work of Mendoza on the open cluster Coma Berenices and commented on its impact on the understanding stellar evolution.

Irene Cruz-González reviewed the strange case of V1057 Cyg in the North America Nebula (NGC 7000) that brightened by 4–5 mag., somewhat like FU Ori. When bright, V1057 Cyg has a spectrum like a supergiant, i.e., with a low surface gravity. It has been suggested that there was sudden dissipation of a dust cloud, or other proposals.

Manuel Peimbert told about Haro's discovery of faint blue stars, discovered with the three-color exposure method. Later Luyten and collaborators and Haro & Luyten found thousands more, and several conferences about their nature have occurred.

Elsa Recillas reviewed her work on H II regions near the nucleus of M82, this work was done in collaboration with Manuel Peimbert. She also described recent exciting work done at INAOE on M82.

Elena Terlevich continued the discussion of Haro's work on blue galaxies with emission lines. They are (1) blue compact galaxies, (2) Seyfert galaxies, (3) blue compact dwarfs, and (4) AGN (active galactic nuclei).

Helmut Abt reviewed the 16 papers by Tonantzintla astronomers who searched for OB stars to delineate the nearby spiral arms. Unfortunately they did not pursue the determination of their distances and the resulting spiral structure, probably because they felt that the radio astronomers had solved that problem with their 21 cm observations. But those observations resulted in motions, not distances, so they gave a misleading picture of the Milky Way. It is only with the recent infrared observations that showed that the Milky Way is a barred spiral with two major arms and five smaller ones.

A. G. Davis Philip described the work by himself and others on finding early-type stars at high galactic latitudes that are mostly horizontal branch or population II stars. The Sloan survey is now finding thousands more.

Luis F. Rodríguez spoke of Arcadio Poveda's suggestion that contracting pre-main-sequence stars would have disks and planetary systems to absorb the excessive angular momentum. The nature of stellar disks is still being explored, including why the jets are so highly collimated.

Arcadio Poveda derived improved values of M/L for galaxies from improved radii measures and was forced to conclude that the missing mass increases with galaxy masses.

Omar López-Cruz continued with discussions of the de Vaucouleurs profile and the pioneering work of Arcadio and his students on the application of digital computers. He later reviewed the generalizations of the de Vaucoulers profile (Sérsic profile), and commented on the exponents for different kinds of galaxies.

Thus these discussions of individual papers in the Boletín de los Observatorios de Tonantzintla y Tacubaya shows the breadth of the research done there in the earlier years (1952–1972). We are all beneficiaries of that work.