Star Bright, Street Light, Which Will They See Tonight?

Tucson, Ariz. Astronomers are asking that Tucson modify its outdoor lighting so that their view of the heavens will not be obstructed by the city's nighttime glare. Workers at the five observatories* in the mountains surrounding this rapidly growing city of 300,000 fear that in the future they will be unable to observe certain astronomical phenomena, if the amount of light coming from the city continues to increase.

The problems involved are not unique to the Tucson area. Ideally, astronomers would like their observatories located as far as possible from civilization so that the skies they observe could remain dark and free from air pollution. But because they require supplies and technical assistance, the astronomers must compromise and locate the facilities near commercial centers. Often, however, planners have underestimated the growth of the nearby city. Mt. Wilson Observatory, constructed on a site overlooking the sleepy Southern California town of Los Angeles in 1916, became useless for observing some phenomena as early as 1930, and the problem there has since grown continually worse. Robert P. Craft, acting director of the University of California's Lick Observatory, has said that "Lick will be out of the business of observing galaxies, quasars, and other faint objects within a decade" due to nearby San Jose's expansion.

The amount of "light pollution," as the astronomers refer to the interfering city glare, is still far less in the Tucson area than in any other area where California's major observatories are located. The Tucson astronomers want the city government to take steps now (at the city's expense) to ensure that the sky around Tucson will remain relatively free of light pollution.

According to Arthur Hoag, associate director of the Stellar Division at Kitt Peak National Observatory, two types of light from a city's outdoor lighting bother astronomers: ultraviolet light and general glare. Both are scattered in the air by particulate matter; thus air pollution and light pollution are closely related.

The ultraviolet light comes mainly from mercury vapor lamps which are used in Tucson and many other cities for street lights. Most of an observatory's instruments, said Hoag, are particularly sensitive to ultraviolet light. And some of the most interesting spectral emissions from the stars occur at precisely those wavelengths that are obscured by the ultraviolet light from mercury vapor lamps. The second problem is glare from all types of light, which lightens the sky, making it difficult to view faint objects such as distant galaxies.

After thoroughly studying such nonastronomical areas as lighting engineering and city planning, Hoag and some of his colleagues proposed two ways that Tucson could reduce its offending light pollution. They suggested that shields be placed over all outdoor lighting to direct the light toward the ground, thus reducing glare in the sky, and that filters be installed over mercury vapor lamps to screen out the ultraviolet light. Such filters cause the light to appear yellow.

The directors of the five observatories presented Hoag's recommendations to the Tucson city council in the form of a proposed city ordinance requiring shielding and filtration on all new and replacement outdoor lighting. The astronomers felt it unreasonable to ask the city to modify all existing outdoor lighting.

Tucson's light pollution, photographed from Kitt Peak.

The report, containing the proposed city ordinance, reminded the councilmen that over $60 million had been invested in the Tucson area observatories and that the combined annual budgets of the five facilities exceeded $12 million, making ground-based astronomy one of Tucson's major industries.

Tucson city government officials have been generally cordial to the astronomers' request for less nighttime glare. "We feel obliged to do all we can to help these people, as long as it is economically feasible for the city," said Tucson's Director of Public Works Verne M. Tregonis. But he added that several details of the proposed ordinance must still be worked out. Tregonis and others felt that the request for both shielding and filtration on all new and replacement outdoor lighting was unreasonable. "I was a bit frightened," said Tregonis, "by the prospect of the filtration eventually causing Tucson to be all yellow at night." Tucson officials have drafted their own light control ordinance calling for either shielding or filtration.

Once the city and the astronomers have agreed upon a means of controlling light pollution, the city will hold a public hearing on the proposed ordinance. There, according to Tregonis, the astronomers light control campaign might encounter some local opposition.

Some private concerns, such as a dog track near the Smithsonian Institution's Mount Hopkins Observatory, have already willingly cooperated with the astronomers. The dog track installed shielding over its lights and, in doing so, discovered that its customers could more easily see the races. But certain businesses that have special lighting needs may object to the proposed control measures. Among these are owners of used car lots, who may be reluctant to have all the cars in their lots appear yellow at night because of the lighting. Whether the owners of these businesses will be willing to make concessions for the sake of basic science remains to be seen.—ROBERT J. BAZELL

*Observatories in the Tucson area: Kitt Peak National Observatory and The National Radio Astronomy Observatory, both operated by associations of universities for the National Science Foundation; Steward Observatory and the Lunar and Planetary Laboratory, both operated by the University of Arizona; and the Smithsonian Institution's Astrophysical Observatory.