

A "Blinking" Satellite

This unusual satellite trail was recorded on an ESO Schmidt plate for the extension of the Quick Blue Survey towards the equator. It was obtained on August 31, 1988 and covers field 815 of the ESO/SERC grid (R.A. = $21^{\text{h}}20^{\text{m}}$;

Decl. = -5°). Whereas the brightness of most other photographically recorded satellite trails is rather uniform or slowly varying, the rapidly changing light along this trail indicates a very fast rotation. Also, the "blinks" are different, and do not repeat in a uniform sequence, showing that the rotation axis changes.

Indeed, if the satellite is at an altitude that corresponds to one revolution around the Earth each 100 minutes, then it rotates about 9 times per second (but it may of course be in a higher, slower orbit). What kind of instruments are on-board? Or is it just another piece of tumbling space junk?

Report on IAU Colloquium 112¹, on Light Pollution, Radio Interference and Space Debris

(Washington, 13 to 16 August 1988)

Light Pollution

Astronomers are the only minority concerned by this problem and thus have to lead the fight without expecting any help, apart from the lighting industry which recently discovered that computer aided design could help improving the efficiency of lighting equipments!

Kitt Peak observatory reported encouraging news from the results of light pollution control in Tucson. Mount Palomar Observatory, where the sky is 0.75 magnitude brighter than it would be without light pollution, is now trying to follow the same path. Apart from getting a legislative support, it is advised to acquire comprehension, understanding and help from the population. This is possible through a long term policy aiming at raising interest about the science made in astronomical observatories, for instance by means of guided tours, with

a better long term efficiency when school children are concerned.

The main cures for light pollution are the generalized use of low pressure sodium lamps because their radiation is easier to filter out, and a better shielding of street lighting (60% of the total pollution). Outdoor sport facilities remain a problem but most are fortunately not lighted during the whole night. Time control of residential area lighting can help darkening part of the nighttime.

An argument to convince city mayors to take actions is that the young urban generation is raised without having the possibility to enjoy the vision of the night sky (of course, in that case, as for amateur astronomers, the low pressure sodium does not help much). Planetariums are also considered as a way to sensitize the population and should include some striking examples in their shows (polluted versus non-polluted sky).

As shown on Figure 1, La Silla lies in a particularly favourable area now, and so did Mount Palomar observatory when the site was chosen . . .

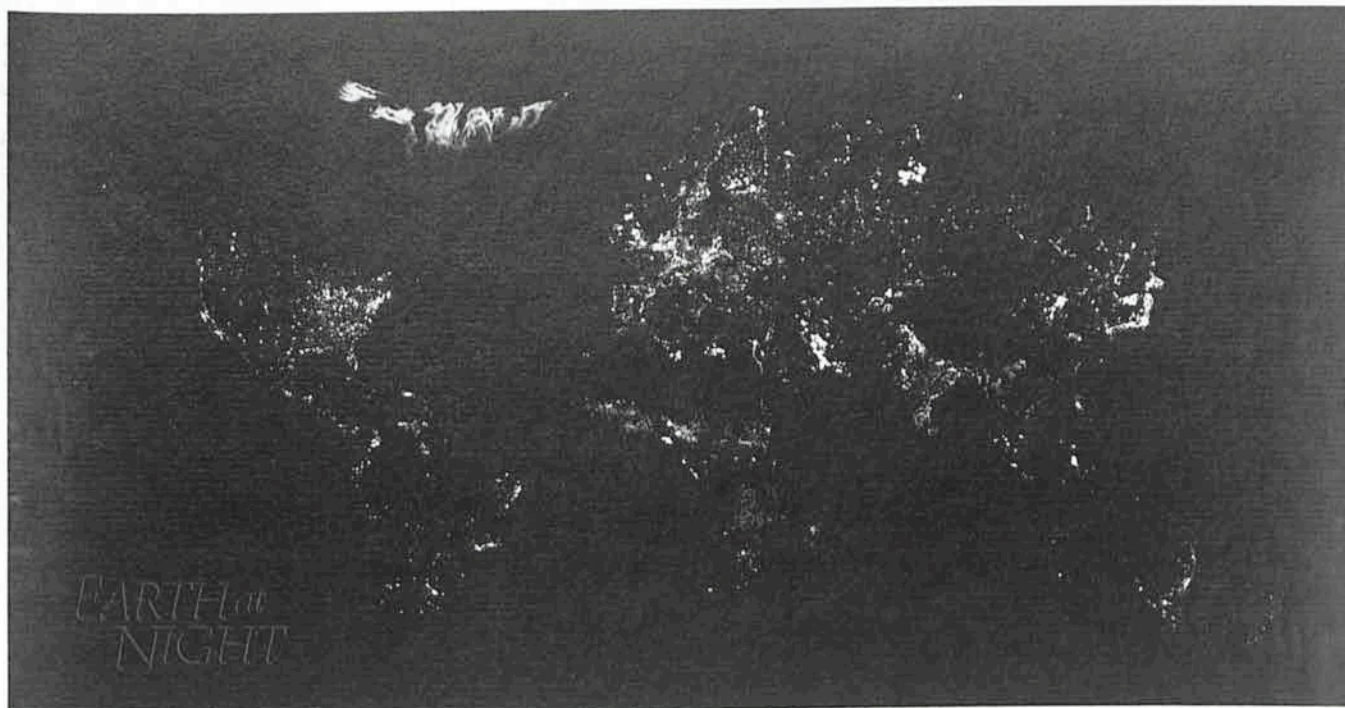
Radio Interference

Radio astronomers represent a small percentage of radio wave users, all of them being concerned with maintaining some good order in the radio community. With the expansion of satellite radio communications, there is a growing need for frequencies. The distribution of the radio spectrum is made on a worldwide basis during a so-called "World Administrative Radio Conference" (WARC).

The U.S. radio astronomers have several channels in their administration to get a voice at WARCs, the situation is somewhat more difficult in Europe where each country has its own regulations. The newly created European "Committee on Radio Astronomical Frequencies" (CRAF) tries to be present during negotiations. Radio astronomers are advised that it will be practically impossible to get new frequencies in the future and that they have to keep on justifying the usefulness of the already attributed ones.

Among the most affected users by

¹ This colloquium was organized by D.L. Crawford (Kitt Peak National Observatory) and T. Gergely (National Science Foundation, Div. Ast. Sci.)



The Earth at night: this photo-composition of many satellite pictures illustrates the different sources of light pollution. In addition to light emission from urban areas, note the agricultural savannah fires in central Africa, natural gas flares from oil fields (Persian Gulf, North Sea . . .) and also the Aurora Borealis in the north. Credits: United States Air Force / DMSP Archives, National Snow and Ice Data Center, NOAA, University of Colorado / W. T. Sullivan, II, University of Washington, Seattle / Kerry Meyer.

radio frequency interference, one could mention the SETI programme, dedicated to the Search for Extraterrestrial Intelligence in the 1–10 GHz band.

The main pollution is created by radars but in urban areas, there are various other less known sources such as defective home appliances or high success gadgets like garage door remote openers. U.S. regulations allow observatories to proceed to inquiries in case of nuisance from such local sources of radio pollution.

A satellite dedicated to the detection of radio frequency interference from space will be operational in 1992 in frequency bands near 300 MHz.

Space Debris

This is an issue which goes far beyond the astronomical community. Any new spacecraft design has to include an anticollision shield. Damages due to col-

lision with objects other than meteoroids may be severe and the pressure for reducing the threat will be stronger and stronger. ESA created in 1986 a working group on space debris and a report will soon be available.

It is estimated that 70% of debris come from military explosions which have now been banned. More than 7,000 objects larger than 10 cm are tracked by the North American Aerospace Defense Command (NORAD). A catalogue is available to civilians and astronomers from the Naval Space Surveillance Center (Dr. S.H. Knowles, Dahlgren, VA, U.S.A.).

The number of debris increases constantly because of mutual collision and the critical density could be reached in 50 years if nothing is done. Cleaning the small debris by retrieval is considered as unrealistic nowadays because of the cost. Short term solutions such as propulsion of obsolete satellites to a "dis-

posal" orbit could create a belt of debris around the earth. A third solution is the re-entry through the earth atmosphere for disposal.

As for consequences on astronomy, each photographic plate of the new Palomar sky survey includes an average of five tracks from satellites or debris. The space telescope will see 4 debris of 10th magnitude per hour per degree of field of view and 1,000 debris of 20th magnitude per hour per degree of field of view. A geostationary satellite is seen from ground with mag 14. The space shuttle is mag -3. Solar panels send bright flashes to ground and may interfere with gamma ray burst observations. According to the relative position of the Sun, one square inch of solar cell can be visible with the naked eye. At least one optimistic information to conclude: those problems usually occur only until two hours after sunset and start two hours before sunrise. M. SARAZIN

50 Years of RGU Photometry

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1. Introduction

Fifty years have elapsed since W. Becker (1938) proposed to use three-colour photometry for the study of stars

which are too faint for spectral classification. He stressed that the choice of the passbands had to be guided by the properties of stellar radiation rather than

by the properties of existing instruments. The three passbands were chosen such as to reflect the two basic characteristics of the visible spectral