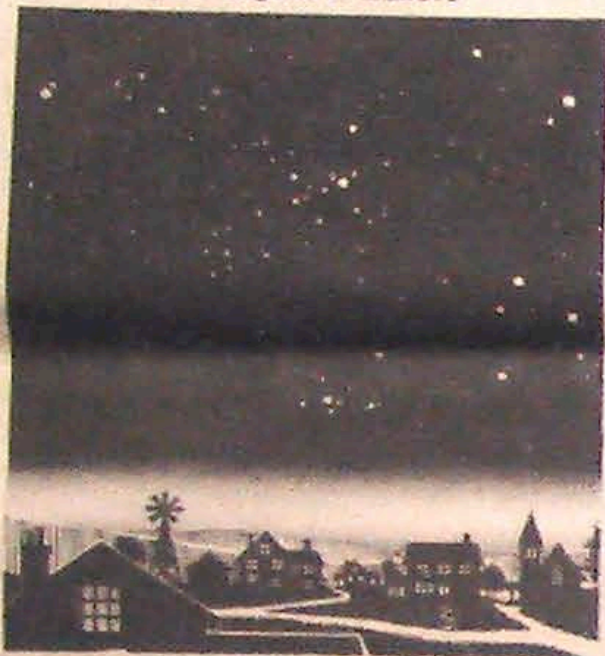


STARBOUND

THE WONDER OF
SPACEFLIGHT AND ASTRONOMY

by Dr. Eugene F. Mallove



WHY IS IT DARK AT NIGHT?

Why do we have dark skies at night? To what do we owe the splendor of an ink-black night sky peppered with brilliant stars? Surprisingly, the answer is not simply that the Earth rotates once each day on its axis and thus turns the side on which we live away from the glaring sun. It is true enough that one requirement for darkness is to be turned away from the nearest star, our Sun, but what about the distant stars — why don't they make the sky brilliant with light at night? Perhaps there are too few stars and galaxies to do this?

Wilhelm Olbers pondered this question of night's darkness back in 1823 and popularized it as a paradox — "Olbers' Paradox." He and several others before him reasoned that in a very large or perhaps infinite universe the multitude of stars should make the entire sky appear as bright as the surface of our Sun! This is because the reduction, due to distance, in the intensity of starlight reaching us would be exactly counterbalanced by the increase in the number of stars sending their light from an increasing distance. Even allowing that the nearer stars help to block light from more distant ones, the sky should still be as bright as a star of average brightness such as our Sun. We would all be literally fried in the intensity of this light — in fact life as we know it could not exist in such a universe.

The real reason that it is dark at night is the undoing of Olbers' Paradox. The reduction in light intensity with distance must not be exactly counterbalanced by increasing numbers of stars. The full resolution of the paradox was known only in this century with the discovery that the universe of galaxies of stars is expanding. Starlight from distant galaxies is dimmed by the so-called "red-shift," or the changing of its color toward the red due to motion away from us — much as a receding train's whistle appears to have a lower pitch. The finite age of the expanding universe also partly explains the paradox — light from very distant galaxies has not had time to reach us yet! Startling as it may seem, the night sky is dark and Earthlings live due to the grace of an expanding universe perhaps 20 billion years old. The paradox of Olbers, which dealt with so common a phenomenon as night, foreshadowed truly a revolution in cosmological thought.