quence stars, and Figure 3 shows a HR diagram with a number of them plotted together with Bernes 135.

The association between a highly unusual young pre-main-sequence star and a dense Bok globule provides compelling evidence that Bok globules, at least under the proper circumstances, can indeed form stars. CG 1 may well be the smallest observed dark cloud known to have formed stars.

## Bok Globules and Herbig-Haro Objects

CG 1 is not the only one of the globules in the Gum Nebula which has formed stars, several of them are associated with stars and Herbig-Haro objects. Herbig-Haro objects are small nebulosities with peculiar forbidden emission-line spectra found in certain star-forming dark clouds. Often these objects are found close to a young star or an embedded infrared source, from which they move away with highly supersonic velocities. The Herbig-Haro objects may be associated with violent eruptions known to occur in some young stars.

An example of a Herbig-Haro object in one of the cometary globules in the Gum Nebula is seen in Figure 4. The Herbig-Haro object is the small oblong nebulosity near the center of one of the globules, numbered CG 30. This Herbig-Haro object is presently being studied by Pettersson and Westerlund, and its presence indicates that a young star is still embedded inside the globule.

Dark clouds are known to be inhomogeneous with "cores" of more dense material, and it is possible to understand the cometary globules in the Gum Nebula as such cores of dark clouds, exposed by the eroding effects of the ultraviolet radiation from the central O stars. Above the spectacular complex of globules in Figure 4 is seen a less dense, small dark cloud, an association known also for several others of the globules, and this can be understood as the remnants of the original cloud in which the core resided. In many cases, as in Figure 4, the globules show evidence of severe disruption, and this can be modelled using the theory of Rayleigh-Taylor and Kelvin-Helmholtz instabilities. The force involved is not radiation pressure, but the rocket effect, which arises when the ultraviolet radiation evaporates the outer layers of the globules, and the hot gas expands supersonically towards the O stars, pushing the globules away from the center of the Gum Nebula.

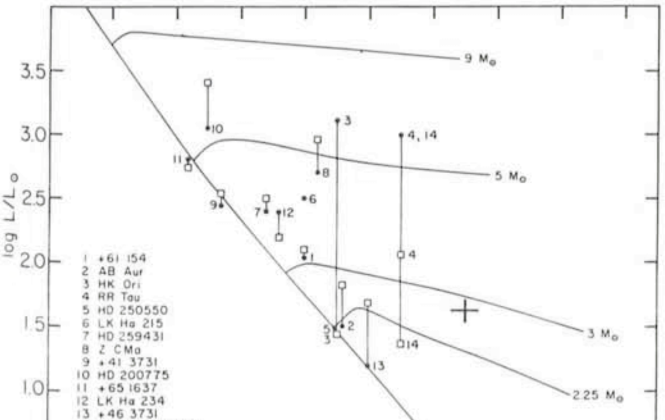


Fig. 3: *The position of Bernes 135 (shown by a cross) in a theoretical HR diagram with a number of young Herbig Ae/Be stars. (Diagram from Strom, S. E., Strom, K. M., Yost, J., Carrasco, L. and Grasdalen, G.:* Astrophysical Journal **173,** *353, 1972.)*

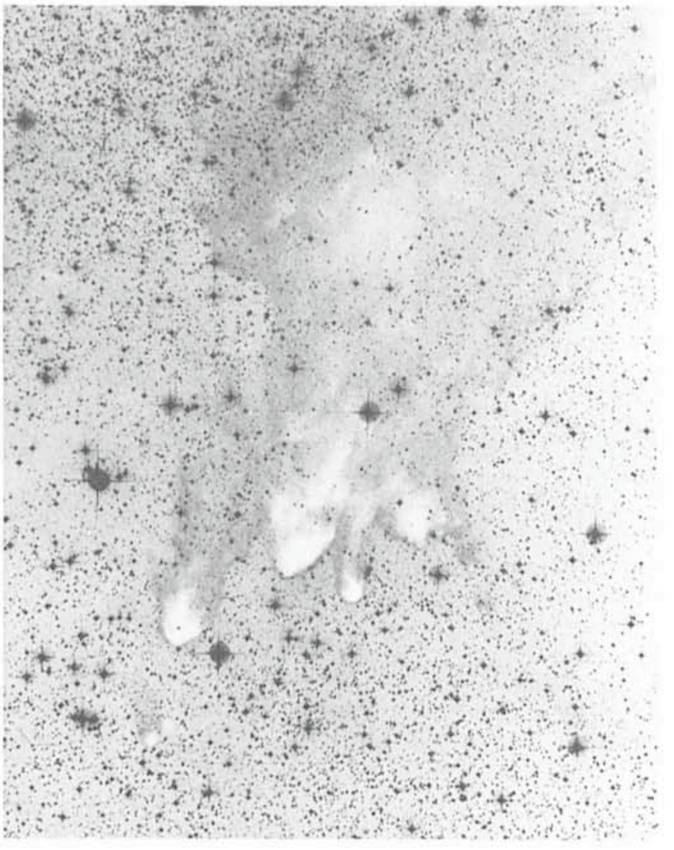

Fig. 4: *The CG 30/31/38 complex of cometary globules in the Gum Nebula. The globules show evidence of disruption. A Herbig-Haro object is seen as a small nebulous spot near the center of the globule CG 30 (SRC-J Schmidt plate).*

Calculations using estimates of the amount of ultraviolet radiation available together with the above-mentioned principles show that the globules have existed for roughly a million years, in relatively good agreement with the present age of the O stars in the center of the Gum Nebula, as well as the age of Bernes 135.

In short, the present work has proven Bart Bok to be right in his idea that globules can form stars. It is suggested that Bok globules are cores from small molecular clouds, exposed after the ignition of massive O stars producing copious amounts of ultraviolet radiation in the region. After the stripping of the cores, they are partly compressed, partly disrupted, and this forces several of the globules into star-forming collapses. In some cases the more massive O stars will die before the globules have been destroyed, leaving isolated globules scattered along the plane of the galaxy, slowly expanding and dissolving into the interstellar medium.

## ESO USERS MANUAL

A new version of the ESO Users Manual is now available. It has recently been distributed to astronomical institutes; if your institute has not received a copy, please contact the Visiting Astronomers Section, Garching. ESO urges all its users to read the manual carefully before applying for observing time.

The manual will be updated periodically and any errors that should be corrected or any information you would like to be included should be communicated to the editor, Anthony Danks.