PROPERTIES AND SIMULATIONS OF INTERACTING SPIRAL GALAXIES WITH TRANSIENT "OCULAR" SHAPES

D.M. ELMEGREEN[1], M. SUNDIN[2], B.G. ELMEGREEN[3] AND B. SUNDELIUS[2]
1) Vassar College Observatory, Poughkeepsie, NY 12601 USA
2) Department of Astronomy/Astrophysics, Chalmers University of Technology, 412 96 Goteborg, Sweden
3) IBM Research Division, T.J. Watson Research Center, Yorktown Heights, NY 10598, USA

This paper discuss that a particular type of bar, with some characteristic features, is the result of galaxy interactions. These features are yet not distinguished by morphological classification schemes. The distinguishing characteristics of this transient (one rotation) phase of an interaction are:

* A bright oval approximately one-half the size of the galaxy centered on the nucleus with a right angled vertex at each end of the major axis.
* Spiral arms extend smoothly from each of the flatter sides of the oval, sometimes showing a double-parallell structure with a large pitch angle.

Because the oval part of the bar resembles a human eye, we refer to this type of galaxy as "ocular".

The simulations fall into three separate categories: (1) Ocular-Bar: an elongated ocular structure that developes into a bar (Figure 1a); (2) Ocular-Spiral: a circular ocular structure that developes into a spiral with no central bar (Figure 1b); and (3) No-Ocular: no ocular structure but only a spiral bridge and tail (Figure 1c).

In real galaxies 24 examples of ocular structure has been found, all have companion galaxies and many have elevated star formation rates. The observation of an ocular galaxy would indicate that an interaction has occured.

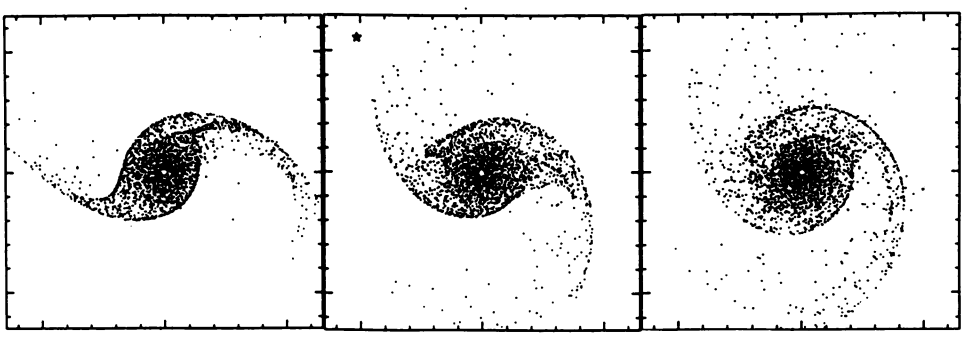

Figure 1a
Ocular-Bar Structure

Figure 1b
Ocular-Spiral Structure

Figure 1c
No-Ocular Structure

F. Combes and F. Casoli (eds.), Dynamics of Galaxies and Their Molecular Cloud Distributions, 133.