pairs. This length fits well with the genetic analysis of *rosy*, since *ry* mutants span 9×10^{-3} recombination units, and 0.01 units has been estimated to represent almost 4×10^{3} base pairs. The *rosy* locus lies in a region of five bands on the polytene third chromosome and since these are of average size this implies that whichever band contains *rosy* has about ten times more DNA than codes for the protein. The *rosy* site, lying at map position 52.0, is bounded by *kar* at position 51.7 on one side and by *l(3)26* at position 52.2 on the other and the isolation of further mutations may, of course, permit a more exact resolution of its extent.

If it is true that the distribution of mutant sites within control elements and structural genes directly reflects their relative sizes, these results show that the *rosy* locus represents a structural gene; for if only part of the region identified by *rosy* mutations had the function of coding for protein, the sites responsible for electrophoretic variation would lie in one small cluster instead of extending to both ends of the genetic map. In support of this contention, Gelbart *et al.* argue that the *rosy* mutations which they selected by X-ray mutagenesis largely represent single base pair alterations. Point mutations in this case must be able to abolish completely the activity of XDH. By using mutagens inducing other types of changes that perhaps might be prone to have effects on control elements, in the future it may be possible to identify regulatory *rosy* mutations. The conclusions that the *rosy* locus is largely occupied by the structural gene for XDH depends also upon the assumption that recombination rates are constant per unit length of DNA throughout both control element and structural gene; for if recombination takes place at a greater frequency in the structural gene than in the control element, the apparent size of the structural gene would be exaggerated relative to the control element. The failure of Chovnick and his colleagues to observe unequal crossing over in their earlier extensive analysis of recombination at the *rosy* locus argues that the structural gene itself comprises nonrepetitive DNA, but leaves open the possibility (now under study) that adjacent control elements might represent repetitive sequences in which recombination is suppressed in order to limit such events. The most probable explanation of these results therefore seems that the *rosy* locus represents the structural gene for XDH, occupying only some 10% of the band in which it is located. Whether the remaining DNA represents control functions associated with the XDH structural gene and thus defines a single genetic unit remains a point for future research.

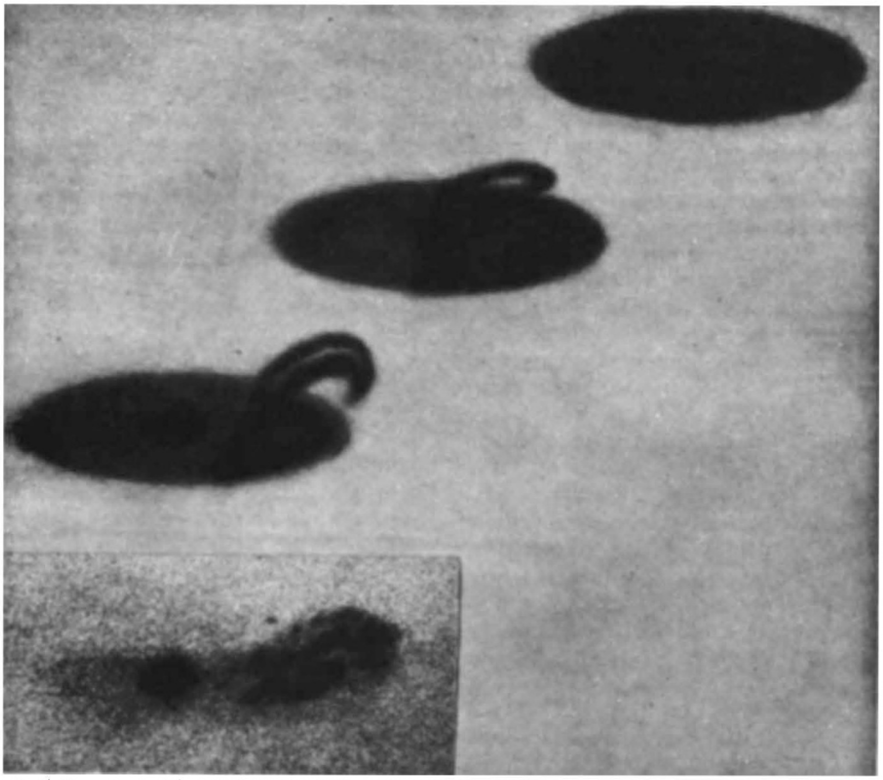
Ring galaxies and intergalactic gas clouds

from Craig D. Mackay

In a recent article in *The Astrophysical Journal* (**194**, 569; 1974), Freeman and de Vaucouleurs attempt to account for the formation of two types of object usually dismissed as "irregular galaxies". The first appears as an irregular ring of gas with a number of condensations within it, the second (an example is shown at the bottom of the accompanying figure) appears as a spheroidal galaxy composed almost exclusively of stars with a small region filled with several blobs of gas.

The ring galaxies have a number of features similar to those of the annulus of gas found in many spiral galaxies. Freeman and de Vaucouleurs consider the possibility that such an annulus was stripped out of a normal spiral galaxy to form a ring galaxy by a collision with an intergalactic gas cloud. The presence of large clouds of neutral or ionised gas moving within clusters of galaxies has been suggested as a convenient way of stabilising clusters of galaxies. The scenario proposed is as follows: Suppose that a gas cloud collides with a normal spiral galaxy as is shown in the artist's impression in the upper part of the figure. Stars, being small and massive, are not affected by the colliding gas cloud. The annulus of gas, however, is progressively stripped out of the galaxy as shown in the figure. Some of this gas may be attracted back towards the massive disk of the galaxy, giving rise to the 'hook' in the lowest of the artist's sketches, a sketch which looks remarkably like the object NGC 7828–29 shown at the bottom of the figure. Eventually all the gas is swept out of the galaxy and a spinning ring of gas is formed moving away from the parent galaxy. This gas ring is unstable and expands (because of the unbalanced centrifugal force) until it is braked by the background gas in the cluster. On fairly short time scales ($\sim10^{8}$ years) instabilities in the gas cause knots to condense in the ring giving structures very similar to the ring galaxies observed.

The main difficulty with Freeman's and de Vaucouleur's model is that it is important the collision happens rapidly enough to ensure that all the gas is swept out in a small fraction of the rotation time of the galaxy (otherwise the ring structure will become grossly distorted). A second problem is that it is difficult to avoid heating the gas ring in such a collision to an extent that the ring structure is completely disrupted. There is, however, no doubt that their model gives a compelling account of the formation of these hitherto unexplained galaxies. Indeed, the elegance of their model ensures that it will receive further serious attention and may help to explain a number of the many other unusual galaxies which are all around us.



Artist's conception (above) of three typical phases of penetration of disk galaxy passing through an intergalactic cloud, with progressive separation of gas annulus from disk; (bottom) photograph of NGC7828–29.