NEWS AND VIEWS

A Quasar on the Doorstep?

It is becoming plain that the nucleus at the centre of the spiral structure of the Galaxy must be the site of unusual astrophysical processes. The latest evidence for this is the observation that the nucleus is a powerful emitter of infrared radiation (see, for example, Becklin and Neugebauer, *Astrophys. J. Lett.*, **157**, L31; 1969). Indeed, the infrared emission is on a par with that from the extraordinarily bright nuclei of the so-called Seyfert galaxies, which are characterized by optical spectra containing unusually broad emission lines, indicating velocities of the order of several thousands of kilometres per second in the nucleus. The Galaxy is the archetypal normal galaxy, and the speculation now is whether the nuclei of all normal galaxies are powerful sources of infrared emission. Certainly the infrared observations so far are a strong argument for the view that normal galaxies and Seyfert galaxies are related objects. Indeed, observations throughout the spectrum are increasingly supporting the notion of a relationship between normal galaxies and Seyfert galaxies as between Seyfert galaxies and quasars.

An ingenious hypothesis by D. Lynden-Bell of the Royal Greenwich Observatory (page 690) may well provide an explanation for the link, and raises the tantalizing question of whether there is a quasar at the centre of the Galaxy, possibly a dead one. The starting point is an estimate by Sandage of the number of quasars at present in the sky, from which Lynden-Bell works out that dead quasars must be sufficiently common for there to be a good chance of finding a dead quasar in the local group of galaxies. When a quasar has used up its nuclear fuel, it will collapse under its own weight and ultimately go out of sight when the gravitational field prevents the escape of light quanta. But general relativity has it that the collapsed body is not entirely lost to the universe, because its gravitational effects can still be felt, and Lynden-Bell therefore expects dead quasars to be at the centres of concentrations of mass—the centres of galaxies, in other words. His picture of the centre of the Galaxy is of a whirlpool of gas, with matter continuously disappearing into the dead quasar. Before matter in the whirlpool can fall into the quasar, it has to lose angular momentum, which will be brought about essentially by the frictional twisting of the magnetic field in the gas cloud and ultimately the acceleration of charged particles. In the outer part of the whirlpool, accelerated particles become cosmic rays, but in the inner regions, collisions convert the energy of the particles into heat and the powerful radiation observed to be coming from the galactic nucleus. To explain the intensity of the infrared source at the nucleus, a modest 10^{-5} of a solar mass per year has to disappear into the dead quasar, with faster rates for the nuclei of Seyfert galaxies.

Why quasars should be at the centres of galaxies is not spelt out in the paper, but one guess is that quasar formation starts while the galaxy is condensing out of the initial cloud of gas. This would lead to a dense differentially rotating superstar at the nucleus—the quasar—with a short lifetime compared with that of the galaxy. By the time star formation is well advanced, the quasar could have exhausted its supply of fuel and undergone collapse.

Interferon Inducers—with Side Effects

Many virologists who embarked years ago on the purification of interferon have now despaired of ever achieving their goal. The astounding potency of this substance—as little as 10^{-9} g is active—is matched only by the difficulty of purifying it with classical procedures.

The potentialities of interferon have nevertheless not been overlooked for want of the pure material. Two international conferences this year in Lyon (Colloquium on Interferon) and New York (Antiviral Substances) testify to a sustained academic and commercial interest in antidotes for viral disease. One of the discoveries holding greatest promise is that of materials which stimulate the production of interferon in living tissues, the principle being that if one cannot actually inject interferon, its amount can nevertheless be enhanced *in situ* with the same prophylactic or therapeutic result. The idea that various polyanions induce interferon stemmed from the proposal that foreign RNA elicits interferon production in animal cells (A. Isaacs *et al.*, *Lancet*, ii, 113; 1963). M. R. Hilleman's group at the American Merck laboratories confirmed this with artificial double stranded polyribonucleotide complexes. And even non-biological polymers such as polymethacrylic acid and copolymers of maleic anhydride and divinyl ether have now been found to be active.

The semi-synthetic RNA complexes are of particular interest in that the mechanism whereby they induce interferon may be related to the way in which virus infection leads to the elaboration of interferon (see *Nature*, **222**, 921; 1969). But this was not the consideration which first stimulated interest in the polyribonucleotide complexes. The story begins with the discovery of anti-viral agents in culture filtrates from species of the fungus *Penicillium*. A substance named "helenine" was isolated from *P. funiculosum*, and another called "statolon" was obtained from *P. stoloniferum*. W. J. Kleinschmidt *et al.* suggested that the active principle in statolon was an anionic poly-