RNA exists than is found for cytoplasmic RNA. Hough *et al.* (*Cell*, **5**, 291; 1975) have studied the hybridisation of purified radioactive unique sea urchin DNA in RNA-excess reactions with gastrula nuclear RNA. These experiments indicate that around 28% of the total complexity of the sea urchin genome is represented in this nuclear RNA. This complexity of nuclear RNA is at least an order of magnitude higher than that found for sea urchin polysomal mRNA. Earlier experiments (Getz *et al.*, *Cell*, **4**, 121; 1975) with mouse Friend cells arrived at similar general conclusions. In this work, the complexity of poly(A)-containing nuclear RNA was assessed by kinetic hybridisations with cDNA. The authors conclude that at least five times more unique DNA is represented in the nuclear RNA than in the polysomal mRNA of these cells. Although the numbers involved in the papers of Hough *et al.* and Getz *et al.* are somewhat different (this difference probably being a result of the use of total nuclear RNA in the former case and poly(A)-containing nuclear RNA in the latter case), the general conclusion is the same—a larger amount of the genomic information is synthesised into nuclear RNA than is present in the cytoplasmic poly(A)-containing RNA. This disparity between the two RNA populations allows speculation regarding the function of the RNA which seems to remain in the nucleus.

Even with these detailed numerical analyses of eukaryotic gene complexity, very little is known of the fine structure of individual genes and genetic units. Studies of these structures should clarify the nature of the controlling elements and specific informational organisation in eukaryotic DNA. □

Excited atoms

from a Correspondent

The ninth international conference on "The Physics of Electronic and Atomic Collisions" was held in Seattle on July 24–30.

ATOMIC physics is finding applications in horticulture: Sir Harrie Massey, delivering the opening scientific talk of the conference, reminded delegates that the study of negative ions, in what was non-applied research in atomic physics, resulted in the method for determining levels of DDT in crops. Though that particular spin-off was successful the nuclear fusion story is a less cheerful one: the level of aid so far given to the thermonuclear fusion programme is worrying. Delegates at

the conference were aware of the immediate need for atomic scattering cross-section data to assist in the construction of a viable fusion machine. It was stressed that measured cross sections for electron scattering of highly excited and ionised atoms and molecules was needed immediately to enable a composite picture of the competing processes in the 'fusion plasma' to be made. An estimated 40% of the power losses from the injected ion beams occurs through the presence of impurity ions such as C^+ , Fe^+ , Mo^+ by way of electron capture, dielectronic recombination and bremsstrahlung losses. But the problem, as expressed by some delegates, is that "the cross section we want today isn't the one we need tomorrow".

Experimental investigations into highly excited states of atoms, for example H, Na, Xe, has advanced very rapidly since the last meeting. In addition to using charge exchange methods for producing high rydberg states, one group (R. F. Stebbings *et al.*, Rice University, Houston) reported that they had used tunable dye lasers in selecting individual high rydberg states in Xe and then measured the ionisation cross section in SF_6 . The use of these highly excited atoms in scattering experiments is now within the range of existing experimental techniques.

Lasers have not yet been exploited to the full in atomic physics for state selection. State and velocity selection of neutral atoms by photo-detachment of the negative ion (C. Linberger, GILA, Boulder, Colorado) is sure to advance the field of reactive scattering. Several groups are considering the determination of atomic beam composition by selective laser pumping.

Doppler free spectroscopy has advanced rapidly; fine and hyperfine transitions can now be measured more easily and accurately than before. The excitation of the $H(1S) \rightarrow H(2S)$ transition by two 2,341 Å photons, using the $H\beta$ level as a reference, has enabled the Lamb shift of $H(1S)$ to be measured. Multiphoton processes and level shifts using lasers are being extensively investigated in many laboratories in the USA and Europe.

The excellent electron scattering work done by many groups has now been complemented by positron scattering data. The measurement of positron differential scattering cross sections awaits the development of higher intensity sources.

The conference indicated very strongly the need now for experimental data on excited state phenomena, not only to aid applied research, but in order to understand better the nature of continuum interactions (U. Fano, University of Chicago) and the formation of bounding molecular states. □

Progress in binary circles

from John Faulkner

At three-year intervals since 1969, the International Astronomical Union has sponsored meetings to review some aspect of our knowledge of close binary stars. The latest and by general consent most successful meeting took place in and around the newly designated Hoyle building at the Cambridge Institute of Astronomy on July 28–August 1. Attendance has more than doubled at successive meetings; IAU Symposium No 73, "The Structure and Evolution of Close Binary Systems", attracted over 110 participants.

ONE reason for the rejuvenation of the subject has been the realisation that most galactic X-ray sources indeed consist of such systems in relatively short lived but highly observable stages of mass transfer between components. Herb Gursky (Harvard University), enjoying his role of Grand Old Man of X-ray astronomy, remarked on the new found respectability of his subject in being awarded the opening day rather than the last afternoon as before; he went on to show that while there is convincing statistical evidence that systems containing type II supernovae subsequently turn into X-ray sources, the situation is quite otherwise for type I. J. B. Hutchings (Dominion Astrophysical Observatory) reported an impressive spectroscopic confirmation of the disputed period of Sco X-1. Earlier this year Gottlieb, Wright and Liller (Harvard University) announced that a photometric study of old Harvard plates taken between 1889 and 1974 showed luminosity variations of only ~ 0.2 mag with a period of 0.787313 d. This remarkable discovery stood in serious conflict with post-X-ray discovery work by other groups and some scepticism had been expressed. However, Hutchings, Cowley and Crampton have now verified the Harvard period by studying the variable radial velocities of He II emission lines. Taken together, these investigations demonstrate the value of the classical and often lengthy programmes eschewed and frequently despised by the "black holier than thou" school of esoteric astrophysicists. Periods considerably less than a day (Cyg X-3 has $P \sim 4.8$ h) pose evolutionary problems for the picture of neutron stars orbiting more or less massive companions and both P. Ostriker (Princeton University)