The nucleolar rRNA genes provide an excellent system for studying transcription and gene organisation. The 'spreading technique' for visualising transcription in the electron microscope was first developed using nucleolar genes by Miller and Beatty. It has now been combined with autoradiography by N. Angelier *et al.* (Centre de Recherche, Ivry Seine) and S. Fakan *et al.* (Cancer Research Institute, Lausanne) to study transcription in nucleolar genes from amphibia and non-nucleolar genes from mammalian cells respectively. Autoradiographs of the typical nucleolar 'Christmas tree' transcriptional unit gave two surprising quantitative results. First, genes which were morphologically identical nevertheless showed different incorporation rates, indicating separate, single cistron control of the rate of transcription. Second, the latter part of the 'Christmas tree' covering the last third or so of the transcribed area showed no increase in the specific activity of the RNA. This may suggest that processing, the trimming of the transcript by nucleases, begins before termination.

One outstanding question is whether there are different sets of ribosomal genes. U. Scheer (Cancer Research Centre, Heidelberg) presented evidence for several size classes of transcription unit within the same organism although the apparent length of consecutive units on the same DNA axis seemed very uniform. M. Buongiorno-Nardelli (Embryology Institute, Rome) showed, in *Drosophila*, that the ribosomal genes of the same size class occur adjacent to each other in blocks and only selected size classes are amplified. Not only may the spacers and transcription units be different in length, but further confirmation that the rRNA precursor may be heterogeneous was again forthcoming. Scheer confirmed that the molecular weight of the pre-rRNA did not always agree with the transcript length and was sometimes heterogeneous. Supporting Scheer's electron micrographs D. Rungger and M. Crippa (University of Geneva) provided evidence that it is possible to detect RNA which hybridises to cloned ribosomal spacer DNA and that longer transcripts than the 40S pre-rRNA in *Xenopus* can be detected when processing is inhibited by fluorouridine. This suggests that transcription sometimes runs into the spacer.

A lively round-table discussion tried to put these and other results together; it is still not possible to define the primary transcript exactly since the pre-rRNA may already be partially processed; no triphosphates have been found at the 5′ start of the precursor; there may be some variability or multiplicity of initiation sites and read-through into the spacer, and perhaps a sliding or non-transcriptional movement or relocation of the polymerase carrying the RNP fibril. The mechanism and control of transcription of the ribosomal genes is clearly far from being understood despite the large amount of established data. The failure to find initiation *in vitro* with isolated nucleoli does not at present clarify anything.

However, as on every previous occasion, possible candidates for enzymes which process the precursor were described. M. Muramatsu (Tokyo University) had one; I. Grummnt (Max-Planck-Institute, Munich) in collaboration with R. Crouch and S. Hall (National Institutes of Health, Bethesda) described a purified enzyme from the nucleolus which cleaves double-stranded RNA and converts the 45S precursor into distinct cleavage products; it is inactive under the conditions usually used for *in vitro* transcription by nucleoli. Perhaps this time a real processing enzyme has been identified. The spreading technique also provides evidence for the absence of nucleosomes in the nucleolar transcription complexes, which have the same length as measured on purified DNA (Scheer). This can be reconciled with the biochemical evidence for the presence of histones in the transcription complex by the idea that the nucleosome is a dynamic structure (reviewed by T. Tsanev (Bulgarian Academy of Sciences)) whose components may be rearranged in certain conditions. This would allow the conclusion that all the histones are present and arranged in units which can readily associate to form nucleosomes but which are sensitive to detergent and may only appear as a 3-nm fibril in spread preparations.

A clue to the way histones and nucleosomes might regulate transcription was presented by H. Busch (Baylor College of Medicine, Texas). By comparing the protein patterns from chromatin from active and inactive nucleoli he has discovered four proteins which markedly decreased in active chromatin. One of these proved to be a branched molecule containing a complete H2A sequence linked to the protein ubiquitin. One-fifth of the nuclear H2A could be accounted for in such molecules. He postulated that such a molecule in this proportion might easily have a key role in transcriptional regulation through the linking of nucleosomes in the stabilisation of the supercoils in condensed chromatin.

Various reports showed that both HnRNA and nucleolar RNA synthesis is located at a cytological boundary. For HnRNA this is between dense and diffuse chromatin; for rRNA it is at the surface of the nucleolus organising region within the nucleolus.

Several speakers addressed the problem of how pre-messenger RNA is transported to the cytoplasm. It appears that it is wrapped in a wide variety of proteins, transported to the cytoplasm through the nuclear pore and there stored as protein-bound RNA or used immediately on polysomes. S. Penman (Massachusetts Institute of Technology) described a cytoskeleton (See *Cell* **10**, 67; 1977) on which all cellular RNP is apparently translocated within the cell. Penman believes that this cytoskeleton provides a morphological explanation for the rapid interference with processing and translocation when transcription is inhibited and also accounts for the fact that RNA is never 'free' in the cell.

Support for the idea of such a cytoskeleton was provided by U. Lönn (Karolinska Institute, Stockholm) who reported microdissection experiments on the cytoplasm of polytene cells

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A hundred years ago

SOME of our readers may like to know that, as might have been expected, the three rhinoceroses now exhibited in the Alexandra Park are specimens of the African Black Rhinoceros (*Rhinoceros bicornis*). This species is extremely uncommon in menageries, and we have heard of no other in this country except the fine adult male now living in the Zoological Society's Gardens in Regent's Park.

It is perhaps a fortunate thing that our politicians, like the Chancellor of the Exchequer and Mr. John Bright, are beginning to concern themselves in their public addresses with science as well as art. With reference to Mr. Bright's recent address, as the *Times* remarks, if his hearers complain that they have not been told much about either science or art, we can only say that we agree with them, and that we deplore our common loss. In the coming time it is to be hoped that public speakers, like Mr. Bright, will know better what science really is than they seem to do now.

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