More RNAs for oocytes

from Pamela Hamlyn

ALTHOUGH *Xenopus laevis* oocytes are interesting in themselves as a means of studying gene action, their more familiar role is that of an assay system for the translation of injected messenger RNAs. They have many advantages for this purpose, not least their ready availability—several thousand mature oocytes from one adult female. (Compare this with scanning the shelves of health food shops for just the right wheat germ.) Injected messenger RNA is translated with a high efficiency, globin mRNA being translated at nearly the same rate as in intact reticulocytes. Because of this very high efficiency only minute amounts of mRNA are required to produce detectable amounts of protein product and consequently mRNA activity can be detected even when crude RNA fractions containing very little mRNA are injected into oocytes.

van der Donk made use of this property in some experiments that are reported in this issue of *Nature*, **256**, 674; 1975). He is interested in the mechanism by which the style of *Petunia hybrida* is able to recognise and to differentiate between its own pollen and that of another plant. (Pollen tubes only grow after cross-pollination.) Total RNA extracted from self-pollinated styles stimulated protein synthesis (by about three times) when injected into *X. laevis* oocytes. A fractionation of the RNA according to molecular weight showed that it was the RNA between 5S and18S that gave the biggest stimulation. But stimulation of protein synthesis is completely inadequate as proof that the injected RNA is being translated. Stimulation of endogenous protein synthesis cannot be ruled out as an explanation unless the protein for which the injected messenger codes is shown to be synthesised in the oocytes. The endogenous protein synthesis in the oocyte is higher than in some cell-free systems. In spite of this disadvantage van der Donk was able to demonstrate the appearance of several new protein bands on gel electrophoresis of proteins synthesised in oocytes injected with plant RNA. Nonetheless it could be argued that these bands were oocyte protein whose *de novo* synthesis was stimulated by the plant RNA. To identify them as plant proteins van der Donk has attempted to demonstrate their function in the inhibition of pollen tube growth. Protein can be isolated from styles after self-pollination which, when transferred to a style that has been cross-pollinated, will inhibit the growth of pollen tubes in that style. Therefore a solution of proteins synthesised in oocytes in the presence and absence of RNA isolated from self-pollinated styles was applied to styles that had been cross-pollinated. Only the proteins synthesised in the presence of the plant RNA were able to inhibit the growth of the pollen tube. Van der Donk takes this as a clear demonstration that at least part of the proteins translated from plant RNA are those involved in the incompatibility reaction (the inhibition of pollen tube growth), and that by partially isolating the RNA coding for these proteins a further step has been made in the elucidation of the intriguing mechanism by which a plant distinguishes between self and non-self.

Gurdon and his colleagues have demonstrated the very long life—up to 10 days—of globin mRNA after injection into oocytes (Gurdon, Lingrel and Marbaix, *J. molec. Biol.*, **80**, 539; 1973). Allende and coworkers reasoned that this must be because oocytes contained a very low level of ribonuclease activity or else the RNA was protected in some way from degradation (Allende, Allende and Firtel, *Cell*, **2**, 189; 1974). To distinguish between these two possibilities they injected a variety of radioactive natural and synthetic RNAs into oocytes and followed their degradation with time. They were able to show that some RNAs were degraded and others were not, and concluded that the oocytes contained enough ribonuclease activity to degrade injected RNAs so that those remaining must be protected in some way. They next focused their attention on yeast tRNA—one of the species that survived undegraded in oocytes even after 20 h. In this issue of *Nature* they report their demonstration that oocytes are capable of aminoacylating yeast tRNAs injected into cells even at final concentrations which were much greater than that of their endogenous tRNA content (page 675). They showed that oocytes can be injected with tRNA for phenylalanine to a final concentration in the cell 500 times the normal concentration—acylation taking place so that there is 150 times as much Phe-tRNA as normal. The authors plan to study the effects of this imbalance on the mechanism of protein synthesis.

A hundred years ago

AMONGST the objects which have been recently added to the galleries of the Paris Industrial Exhibition of Geography, and are attracting public notice, we may mention a collection of French birds exhibited by M. Bouvier, the collection of apes from the Gaboon, by the Marquis de Compiègne, and a number of antediluvian fossils from the Mentone Caves. The skeletons of two children which had been buried together are in a splendid state of preservation, exhibiting admirably the characteristics of prehistoric cave-life. These two young people were buried in the home of their parents, very probably because it was the only means of defending their bones against the teeth of ferocious hyænas and other large carnivorous animals which were disputing with man the empire of the future Gaul.

from *Nature*, **12**, 358; August 26, 1875.

Nuclear spectroscopy

from P. E. Hodgson

IN a nuclear transfer reaction angular momentum is conserved vectorially, so that the spin of the final state of the residual nucleus $\mathbf{J}_R = \mathbf{J}_T + \mathbf{j}$, where J_T is the spin of the ground state of the initial (or target) nucleus and j the angular momentum of the transferred nucleon. This j is itself composed of its orbital and spin angular momenta, $\mathbf{j} = \mathbf{l} + \frac{1}{2}$. The angular distribution of the outgoing particle, for example that of a proton in a (d,p) reaction, is usually characteristic of the orbital angular momentum transfer l, and thus l can be determined. Since J_T is known, this suffices to set limits on J_R and to determine it in some special cases.

For example, if $J_T = 0$, $\mathbf{J}_R = \mathbf{j} = \mathbf{l} + \frac{1}{2}$, so that $J_R = l \pm \frac{1}{2}$. So if $l = 2$, the final state is $d_{3/2}$ or $d_{5/2}$. This ambiguity may be resolved either by rather difficult measurements of the polarisation of the outgoing particle, or by careful examination of some special features of the differential cross sections (*Nature*, **250**, 464; 1974; **253**, 501; 1975).

The situation is more complicated if J_T is greater than zero, for then several values of j may be possible in reactions to states of the same J_R. Thus if $J_T = \frac{1}{2}$, $J_R = 1$, and $l = 1$, then j can be $\frac{1}{2}$ or 3/2. It is an interesting problem to determine j, for if this can be done we can learn more about the reaction and also use such reactions to determine J_R in cases where it is not known. Furthermore, j has to be known in order to apply the j-dependent sum rules to determine nuclear spectroscopic factors (*Nature*, **249**, 695; 1974).

Some years ago Kocher and Haeberli (*Phys. Rev. Lett.*, **23**, 315; 1969) showed that the vector analysing power in one-nucleon transfer reactions is