changes in conformation, or the 60–70S RNA comprises an assembly of 30–35S subunits held together by heat labile, DMSO labile bonds—in short, hydrogen bonds. If the second model is correct, as is widely believed, and if relationships between sedimentation coefficients and molecular weight derived for small RNA molecules are valid it is simple to calculate that the 60–70S RNA has a molecular of weight about $10–12 \times 10^6$ and that the putative 30–35S RNA subunits have a molecular weight of about $3.3–3.5 \times 10^6$.

Two lines of evidence support the notion that the 60–70S RNA of RSV is an aggregate of subunits—in other words that the RSV genome is segmented; first, when chick fibroblasts are infected by two different strains of RSV recombinant virus particles form a considerable proportion of the progeny. This high frequency of recombination, which is also a characteristic of influenza virus—a virus with a single segmented RNA genome—can readily be explained if the RSV genome comprises three or four RNA chains, for in mixed infections progeny virions may assemble by taking combinations of RNA subunits of the two parental types. Second, Cheung *et al.* (1972) and Canaani *et al.* (1973) have just reported quite different physicochemical evidence which suggests that 30–35S RNA may be a precursor of 60–70S RNA.

Cheung *et al.* (*Virology*, **58**, 51; 1972) harvested Prague strain RSV from chick fibroblasts at 5, 10, 20, 60 and 180 min and 12 h and 24 h intervals. The 5 min harvest virus proved to contain little 68S RNA, but it contained a heterogenous RNA with a median sedimentation coefficient of 55–60S which on denaturation yielded 36S RNA and RNA sedimenting between 36S and 4S. By contrast 24 h harvest virus particles yielded a homogenous 68S RNA which denatured to yield homogenous 36S and 4S RNAs. Particles harvested at intermediate times yielded RNA patterns which were intermediate between these two extremes.

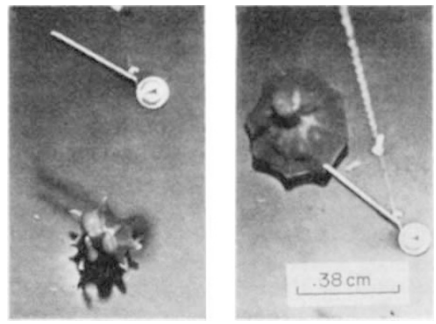
Canaani *et al.* (*Proc. US Nat. Acad. Sci.*, **70**, 401; 1973), who found themselves down wind, so to speak, of Cheung and his colleagues, made similar experiments harvesting Prague RSV particles at only 3 min intervals. They then compared the sedimentation properties and electrophoretic mobilities of the RNA in 3 min harvest virus with the RNAs of virus harvested at hourly intervals. They found the rapidly harvested virus contains a little 60–70S RNA but a large amount of 30–4S RNA and a variable amount of 4–12S RNA. Furthermore, incubation at 40° C for 3 min of the 3 min harvest virus results in the conversion of most of the 30–40S RNA into 60–70S RNA.

These results suggest that 30–4S RNA is a precursor to 60–70S RNA and, as Canaani *et al.* point out, the conversion may involve the association of 4S RNA. They say this for two reasons; first, when 60–70S RNA is denatured back to 30–40S RNA five times more 4S RNA is released than is released when 30–40S RNA from 3 min virus is denatured directly; second, 30–40S RNA from 3 min virus is about five-fold less efficient as a template for reverse transcriptase than 60–70S RNA, and 4S RNA is believed to act as a primer for reverse transcription. Of course, the report (Jarrett *et al.*, 1971) that some free 30–40S RNA can be isolated directly from feline leukaemia virus particles harvested at long intervals gains significance in the light of these experiments.

CEPHALOPODA

Deep-sea Cirromorphs

DEEP-SEA cirromorphs (Cephalopda) have been recorded and photographed for the first time in the Arctic Ocean (Pearcy and Beal, *Deep-sea Res.*, **20**, 107; 1973). Out of more than 2,900 photographs taken off Point Barrow, Alaska, from USS Staten Island, cirromorphs appeared in twenty-one, representing a maximum of twelve individuals; all were at depths ranging from 3,219 to 3,786 m.



The cirromorph in these photographs (taken 15 s apart) is swimming upright or perpendicular to the bottom, with its fins appearing to stroke horizontally. The arms and web in this sequence are first joined together and extend toward the bottom (left) and then expand laterally to form a large umbrella-like surface (right). A second mode of locomotion—swimming in the horizontal position, which is more typical of cephalopods—was also noted.

Initiation of Eukaryotic Protein Synthesis

NEXT week, in *Nature New Biology* (March 14), Schreier and Staehelin present a detailed study of the roles of two purified protein factors involved in polypeptide chain initiation in eukaryotes. These authors suggest that the mRNA-independent binding of the initiator Met-RNA$_f$ to the 40S subunit is the first step in polypeptide chain initiation in eukaryotes and that this complex then directs the building of mRNA.

Four initiation factors, IFE$_{1,2,3,4}$, were purified from rabbit reticulocytes by means of DEAE-cellulose followed by preparative glycerol density gradients. IFE$_2$, IFE$_3$ and GTP are absolutely required for the binding of Met-RNA$_f$ to 40S subunits in the absence of mRNA. Two forms of IFE$_3$ with sedimentation coefficients of 15S and 17S were detected, the smaller form probably being a degradative product of the larger.

With initiator Met-RNA$_f$ purified IFE$_2$ but not IFE$_3$ formed a complex which was GTP-dependent but ribosome and template-independent. In the presence of artificial template poly (A,U,G) and GTP, IFE$_3$ alone did not promote formation of the [40S Met-tRNA$_f$] initiation complex, whereas IFE$_2$ did. When natural globin mRNA replaced the artificial template, IFE$_2$ no longer promoted binding of Met-tRNA$_f$ and 40S subunits, but on the addition of IFE$_3$ to IFE$_2$ the complex was formed. Thus IFE$_3$ is required for binding of natural mRNA. Complex formation in the presence of IFE$_2$ and IFE$_3$ was just as efficient when mRNA was omitted. Thus IFE$_3$ promotes template-independent binding of Met-tRNA$_f$ (presumably complexed with IFE$_2$ and GTP) to 40S subunits.

The [Met-tRNA$_f$ 40S] complex sedimented very close to the original 40S subunits. But in the presence of excess IFE$_3$, subunits which had not bound Met-tRNA$_f$ sedimented at about 48S, a sedimentation rate compatible with a particle composed of a 40S subunit complexed with IFE$_3$. Schreier and Staehelin suggest that IFE$_3$ combines initially with a 40S subunit to direct the binding of Met-tRNA$_f$. Subsequently the bulk of IFE$_3$ must dissociate from the initiation complex but a component of it may remain attached, to direct binding of mRNA. If IFE$_3$ were heterogeneous with regard to such a component, this might provide a mechanism for mRNA selection.

In conclusion, IFE$_3$ promotes the mRNA-independent binding of Met-tRNA$_f$ to the 40S ribosome subunit in the presence of IFE$_2$. In that the initiator tRNA is bound first to the ribosome and helps the binding and correct phasing of messenger rather than the converse, this model of polypeptide chain initiation in eukaryotes is fundamentally different from the bacterial mechanism.