JUPITER

Probing by Pioneer

by our Cosmology Correspondent

THE most distant journey of exploration so far attempted is due to begin soon with the launch on February 27 of the Jupiter probe Pioneer F from Cape Kennedy. If all goes well, this two year mission will send back data from interplanetary space and the asteroid belt before flying by Jupiter at a distance of 87,000 miles. Pioneer will not enter orbit around Jupiter, however, but will continue through the outermost regions of the solar system, eventually escaping altogether from the Sun's influence. As well as the importance of the Jupiter mission itself, this marks another great step forward in the history of space exploration, with Pioneer F eventually becoming the first man made object to travel in interstellar space.

Experiments carried by Pioneer F will study magnetic fields and cosmic rays in interplanetary space, as well as observing the atmosphere and magnetic field of Jupiter. The continued success of spacecraft such as Mariner 6 and Mariner 7 long after their planned lifetimes had expired shows that the difficulties of constructing instruments which can function in space for years have been largely overcome. Where the Pioneer project is breaking completely new ground is in the distance over which communication must be maintained, and in the use solely of nuclear power to generate the electricity to run the experiments and maintain com-

munication with the tracking station.

Because of the communication problem, Pioneer F appears almost to be an interplanetary radio antenna with a few experiments stuck on the back (see figure); once in space the four radio-isotope generators used to provide electricity will be deployed at the ends of long booms, removing them from the sensitive experiments and giving the craft a rather more balanced appearance. This power supply, which is similar to those used for Apollo experiments left on the Moon, has a design lifetime of five years. Past performance suggests, however, that they will last for much longer, and although it is extremely likely that contact with the Pioneer will be lost long before it reaches the edge of the solar system, it seems reasonable to expect a continuing flow of data for some time after the close approach to Jupiter.

Depending on the exact date of the launch (the launch window is from February 27 to March 13), the craft will arrive at Jupiter, if all goes well, sometime between October 1973 and June 1974. A similar mission, Pioneer G, is scheduled for launch in April 1973.

NUCLEIC ACIDS

Silk Messenger

from our Cell Biology Correspondent

IF there is one lesson to be learnt from the recent history of biology it is surely that if the biologist is to answer questions of the most general biological significance he must have a talent for selecting the most appropriate experimental system or organism; he must not only know what questions are important but also where best in the plant and animal kingdoms to start to seek answers. The work reported by Suzuki and Brown in the current issue of the *Journal of Molecular Biology* (63, 409; 1972) shows clearly that these authors have that talent in full measure.

Suzuki and Brown, like many another group these days, wanted to isolate and purify a messenger RNA species from a eukaryotic cell with the ultimate aim of investigating its synthesis and metabolism. But instead of following the already overcrowded paths leading to reticulocytes and myelomas, Suzuki and Brown turned their attention to the silkworm *Bombyx mori*. The larvae of this insect secrete fibroin, silk protein, of which no less than 45 per cent of the amino-acid residues are glycine and in silk the glycine residues alternate predominantly with alanine and serine residues. Furthermore, the fibroin is made in the posterior silk glands of the larvae which can be dissected from the rest of the carcass.

A simple calculation, using known codon assignments, leads to the predic-

tion that fibroin messenger should have a G+C content of at least 57 per cent and a G content of about 40 per cent. It should therefore be possible to extract from the silk glands of larvae an RNA with this most unusual base composition. After labelling for 24 hours with ^{32}P -ortho-phosphate fifth day fifth instar larvae, Suzuki and Brown sure enough were able to isolate an RNA sedimenting at between 45S and 65S which proved to contain 59 per cent G+C residues, 40 per cent G residues and 19 per cent C residues. This RNA, which accumulates slowly and is more stable than either heterogeneous nuclear RNA or ribosomal precursor RNA, comprises, at the end of larval life, 0.8 to 1.4 per cent of the total RNA in the posterior silk gland, the only organ from which it can be isolated.

After partially purifying their putative fibroin messenger by polyacrylamide-agarose gel electrophoresis, Suzuki and Brown compared the pattern of oligonucleotides liberated from it during digestion by RNAase T1 or pancreatic RNAase with the pattern which can be predicted by writing out a base sequence for fibroin messenger knowing its amino-acid sequence and using accepted codon assignments. The products of digestion so closely match those predicted that there can be no doubting that the isolated RNA is at least 80 per cent pure fibroin messenger in which glycine is coded by GGU and GGA, alanine by GCU and serine by UCA. As Suzuki and Brown comment, the posterior silk gland of *Bombyx mori* larvae offers many advantages to anybody intent upon unravelling the synthesis, maturation, transport and translation of a specific messenger RNA. No doubt many a biochemist will be seeking a crash course in insect anatomy and Japanese exporters of silkworms can look forward to a boom in demand.

In the same issue of the *Journal of Molecular Biology* (*ibid.*, 575), Schochetman and Perry report a series of pulse labelling experiments which indicate that in L cells in culture RNA molecules which are tentatively identified as histone messengers are transported from nucleus to cytoplasm at an unusually rapid rate. Within 2.5 minutes of labelling with a pulse of ^3H -uridine, RNA with a molecular weight of about 150,000 can be extracted from cytoplasmic polysomes; RNAs with a higher molecular weight (10^5 to 2×10^6) appear in the polysomes only after a lag of about 15 minutes. Schochetman and Perry suggest therefore that very rapid transport to the cytoplasm can be added to the two other characteristics of putative histone mRNAs, namely their short half life and their synthesis during the S phase of the cell cycle.

Pioneer F being prepared for tests prior to launch. Information about the outer regions of the solar system may well be obtained from the craft for seven years, until it reaches a distance of some 2.4×10^9 km from the Sun.