occultation of the craft as they are eclipsed, and accurate determinations of the orbits of the two moons of Mars, depend only on gross effects of the near planet conditions on the radio signals from the craft, and do not require special on-board equipment.

Cautiously, the planned experiment is on a time scale of only 90 days, although there seems a very good chance that the Mariner craft will again prove reliable for much longer. If so, a contingency plan for a year's experimental work will go into operation. It is encouraging that precautions have been taken to ensure that if either mission fails no debris will fall on Mars.

ELEPHANTS

Musth and Mating

from our Animal Behaviour Correspondent

MATING is a considerable problem for male elephants, partly because of their great weight, which has led to certain structural modifications involving loss of flexibility of the body, and partly because the females live in herds from which bulls are normally excluded. In a recent study of the Asiatic elephant (*Elephas maximus maximus* L.), J. F. Eisenberg, G. M. McKay and M. R. Jainudeen (*Behaviour*, **38**, 193 ; 1971) show how these difficulties are overcome.

To compensate for the limited mobility of the hind limbs and the relatively inflexible sacral joint (both of which are adaptations to bearing weight), the penis of the male elephant shows a great deal of voluntary control. It can be flexed, extended and moved up and down in the vertical plane. This means that in spite of the fact that the male looks so cumbersome, mating may be accomplished very rapidly (it may often take less than thirty seconds) and the female has to bear the weight of the male for only a short time. Elephants also make use of a part of their body which is conspicuously flexible—namely, the trunk—to investigate the scent given off by another elephant.

Another barrier which a bull elephant must overcome before being able to mate is the aggressiveness of other elephants. Typically, cows are found in rather cohesive herds, dominated by the largest and oldest female, whereas bull elephants are semi-solitary for most of their lives, having been chased away from the herds at puberty. When cows and bulls meet, a male's success in courting oestrous females seems to be a function of his age and his aggressiveness ; old aggressive males are the most successful both against other males and against the older cows.

Eisenberg and his colleagues suggest that a curious behavioural phenomenon in male elephants, known as musth, may be an adaptation to the need to be aggressive to secure a mate. During musth, a male shows a dark discharge from the temporal glands and this may often be seen running down the face. Wild males have been seen rubbing these glands with their trunk and smearing the secretion on trees. This and the fact that female elephants show considerable interest in these glands suggest that they are involved in chemical communication.

Wild and captive male elephants are well known to be dangerous during this period, and it may be that musth is a rutting period in which the males temporarily become sufficiently aggressive to overcome the aggressiveness of the older cows.

RIBOSOMES

Fluctuating Complements

from our Cell Biology Correspondent

A FEW weeks ago Stanners and his colleagues reported in *Nature New Biology* (**230**, 52 ; 1971) that hybrid cells, obtained by fusing mouse and hamster cells, contain both mouse and hamster ribosomes. In the *Journal of Cellular Physiology* Stanners and his colleagues now report further elegant investigations of the fluctuations of ribosomal protein and RNA synthesis, and the total ribosome complements of Syrian hamster embryo fibroblasts maintained in different culture conditions.

Stanners and Becker (*J. Cell. Physiol.*,

Replication of RNA Bacteriophages

THE RNA bacteriophages are the simplest known viruses but considering the size of their genome—a single-stranded RNA of some 3,500 nucleotides coding only three proteins—they must surely be ranked among the most sophisticated. For it is clear that the replication of these minute viruses is a finely regulated process. It has been known for some time that the coat protein of R17, Qβ and their relatives promotes its own synthesis by blocking the synthesis of one of the other phage proteins, the RNA replicase. And in next Wednesday's *Nature New Biology* Kolakofsky and Weissman put forward an intriguing model of the way the replicase may promote replication of the phage RNA by blocking the initiation of the synthesis of phage coat protein. Apparently the exigency of selection pressure on the slimmest of genetic resources has led to these phage proteins evolving dual functions.

The single stranded RNA molecule which forms the genome of these phages has to fulfil two functions ; it must act as a messenger specifying the phage proteins and also as a template for its own replication ; it is after all the "chromosome" of these particles. Once liberated from the protein coat the viral RNA in an *Escherichia coli* is first translated like any other messenger RNA. In the case of Qβ, the virus Kolakofsky and Weissman have studied, the first protein made is coat protein and the second a molecule which, together with host components, forms the replicase. The third phage protein, the so-called assembly protein, is probably not made at this early stage even though it is the first of the three phage genes and precedes the coat and replicase genes in the RNA molecule.

Once replicase is made, it can compete with ribosomes for the phage RNA, which it uses as a template for the synthesis first of a complementary RNA strand and then the resulting double stranded molecule can act as a template for the synthesis of many progeny RNA strands identical to that causing the infection. But, as Kolakofsky and Weissman realized, when ribosomes move along the infecting RNA synthesizing coat protein and replicase they are moving in the opposite direction to replicase synthesizing a complementary RNA. The two processes cannot go on together, for if they did a ribosome would collide with a replicase and neither protein nor RNA synthesis could be completed.

How is the collision path avoided ? According to Kolakofsky and Weissman, once a ribosome is on a phage RNA molecule the replicase cannot dislodge it and so the enzyme cannot make a complete RNA chain. They suggest therefore that, once replicase is made, it not only binds to the end of the RNA towards which all the ribosomes are moving but it also loops this end of the RNA to an internal site close to the position at which fresh ribosomes start making more coat protein. Once this situation has been reached all the ribosomes already translating coat or replicase genes finish their proteins and fall off the RNA.

Because it is impossible for more ribosomes to get on the RNA it is rapidly cleared leaving the molecule free of any encumbrances to the replicase which can synthesize a complete complementary RNA strand, and then crank out progeny phage genomes. Later in the replication cycle the coat protein can return the compliment. By binding to a particular site on the many progeny phage RNA molecules it promotes its own synthesis by blocking the synthesis of more replicase.