show that ether anaesthesia affected this response.

Dr Simpson suggested that ACTH may affect the amount of substrate-cholesterol associated with the key cytochrome P_{450} which is involved in the cholesterol side-chain cleavage reaction. Various spectral changes in cytochrome P_{450} were interpreted as the conversion of a cholesterol complex of cytochrome P_{450} in a high spin form being converted to a low spin form of this haemoprotein as the cholesterol is converted to pregnenolone. From these studies Dr Simpson put forward the view that an intramitochondrial transport of cholesterol may be a rate-limiting event in the cholesterol side-chain cleavage reaction in adrenal mitochondria.

LEPIDOPTERA

Not So Ephemeral

from a Correspondent

To the romantic at least it is somehow all too appropriate that animals as exquisitely and delicately beautiful as some adult moths and butterflies should be ephemeral, disdaining to ingest anything but nectar and living only long enough to reproduce their kind. And to the many people for whom the ephemerality of these creatures is part of their beauty, the news that at least some species ingest amino-acids as well as sugars and survive for several months may be positively unwelcome. But that undeniably is the case; as Banziger has reported, at least one Malayan species of moth shares with the mosquito a taste for a blood meal, and now Gilbert (*Proc. US Nat. Acad. Sci.*, **69**, 1403; 1972) has found that some species of the attractive neotropical genus of butterflies *Heliconius* (Nymphalinae) ingest and assimilate amino-acids extracted from collected pollen, which they can neither chew nor ingest. For these *Heliconius* species it seems that pollen rather than nitrogenous fat body laid down by the gorging caterpillar is the chief source of amino-acids for egg protein.

Observations of the behaviour of *H. erato* and other related species in the field, the insectary and the greenhouse provided the first suggestive evidence that these butterflies actively collect pollen for food rather than by accident as a result of drinking nectar. For one thing these *Heliconius* species visit flowers for much longer times than other species and repeatedly scrape the tips of their proboscis over anthers, accumulating loads of pollen visible to the naked eye. For another thing several *Heliconius* species exhibit a curious behaviour by which they appear to mix the dry mass of pollen with fluid, presumably nectar, exuded from the tip of the proboscis, using the proboscis as a whisk. Moreover, the proboscis seems adapted to pollen feeding, for it has papillae at the tip, which are probably chemo-mechanoreceptors, and large mechanoreceptor hairs at the head. Certainly any suggestion that the pollen is collected accidentally is ruled out by experiments Gilbert made with artificial flowers containing minute glass beads instead of pollen; *Heliconius* adults collect these beads as if they were pollen.

How do the butterflies assimilate amino-acids from pollen without chewing or ingesting it? They seem to achieve this by exploiting the fact that when pollen is mixed with sucrose solution most of the free amino-acids in the pollen are rapidly leached into solution. By blending the pollen with nectar the *Heliconius* butterflies provide themselves with a sugary solution of amino-acids, and experiments with solutions of labelled amino-acids fed to these butterflies prove that free amino-acids ingested in solution are rapidly and efficiently assimilated into egg proteins. Furthermore, counts of the numbers of eggs produced by female butterflies reveal that during a period of five days females fed pollen and nectar lay about five times more eggs than females fed nectar alone.

These data clearly indicate that adult butterflies of *Heliconius erato* and probably other species rely on pollen for amino-acids for their eggs and the biology of these animals is consonant with that claim. They have, for example, life spans in the wild and in insectaries of 6 months during which period the females lay eggs at a low (1–10 per day) but steady rate and the males remain sexually active. (Gilbert suggests that proline present in high concentration in pollen may act as an energy store and source.)

Heliconius ethilla bearing large pollen load collected in less than 3 minutes from a single male flower of *Guarania spinulosa* near Arima Pass, Trinidad (from *Proc. US Nat. Acad. Sci.*, **69**, 1404; 1972).

Gilbert draws attention to the evolutionary advantage of dispersing offspring in time and of the coevolutionary advantages of pollen feeding not only to the *Heliconius* butterflies but also to the plants from which they are able to collect limited but continuous amounts of pollen. Whereas some other species of butterfly may supplement their store of nitrogenous food by feeding on dung, urine, rotting fruit and so on, none of these sources is rich enough to be more than a supplement. But pollen, as the *Heliconius* butterflies have discovered, can supply enough amino-acids to support six months of reproductive life.

Mitochondrial RNA Polymerase and Phage T3 DNA

THE transcriptional and translational apparatus of mitochondria from eukaryotic plants and animals is thought to resemble closely its counterpart in bacteria and to be quite distinct from the machinery of gene expression in the nucleus and cytoplasm of eukaryotic cells. Admittedly mitochondrial RNA polymerase (molecular weight 64,000) is a much smaller enzyme than *Escherichia coli* RNA polymerase (molecular weight 450,000), but both enzymes are sensitive to rifampicin and experiments reported in next Wednesday's *Nature New Biology* (July 19) by Richter, Herrlich and Schweiger prove conclusively that the RNA polymerase from the yeast *Saccharomyces cerevisiae* can recognize at least some transcriptional signals which are recognized by the *E. coli* enzyme.

Richter and his associates have separated from isolated yeast mitochondria a cell free system including RNA polymerase which supports coupled transcription and translation. When this system is programmed with DNA of phage T3 two phage specific enzymes are synthesized—lysozyme and an S-adenosylmethionine cleaving enzyme (SAMase). The synthesis of these two enzymes is inhibited by fusidic acid and actinomycin D, but it is inhibited neither by cycloheximide nor by the antibiotic thiostrepton, which blocks bacterial protein synthesis. When phage T7 DNA is used as template, SAMase is not made and this phage does not carry an SAMase gene.

A variety of controls rule out any suggestion that the results of these experiments are artefactual and stem from bacterial contamination of the mitochondria from which the cell free systems were isolated. The SAMase gene of phage T3 is transcribed by the bacterial RNA polymerase when *E. coli* cells are infected, and so whatever transcriptional signals this bacterial enzyme recognizes are also recognized by the mitochondrial enzyme.