Reddaway (*Moor House Occasional Papers*, No. 3; 1971) is likely to prove the most helpful for production ecologists concerned with peatland decay rates. They collected gaseous output from a peatland surface and assessed the flux of carbon dioxide and methane; they also measured organic losses in solution. The gaseous measurements can be considered as the respiratory products of producer, consumer and decomposer organisms from a complete vertical column of the peatland system. Their figures indicate that overall dry matter surplus (available for peat formation) in a Pennine blanket bog varies between 1 g dm^{-2} yr^{-1} on hummocks to 2.7 g dm^{-2} yr^{-1} on *Sphagnum* lawns. In spite of difficulties in measurement and the high variability of data with surface flora and microtopography, this still represents the most promising approach to the measurement of the respiration and potential growth rates of bogs.

Total reconstitution of *E. coli* 50S ribosomes

from a Correspondent

RECONSTITUTION of the *Escherichia coli* 30S ribosome from its constituent RNA and protein has been well established for several years (Traub and Nomura, *Proc. natn. Acad. Sci. U.S.A.*, **59**, 777; 1968), but total reconstitution of the corresponding 50S particle has proved a much tougher nut to crack. A reassembly procedure was described by Maruta, Tsuchiya and Mizuno (*J. molec. Biol.*, **61**, 123; 1971) using proteins liberated by the action of ribonuclease II, but so far no report has appeared of a successful repetition of this result. 50S ribosomes from *Bacillus stearothermophilus* have been reconstituted (Nomura and Erdmann, *Nature*, **228**, 744; 1970) by taking advantage of the higher thermal stability of ribosomes from this organism, but this of course is not so useful since most of the biochemical and genetic information concerning ribosomes has been accumulated from *E. coli*. Hitherto, biochemists have had to content themselves with the 'partial reconstitution' method for *E. coli* 50S ribosomes. This was first reported simultaneously by Staehelin and Meselson (*J. molec. Biol.*, **15**, 245; 1966) and by Hosokawa, Fujimura and Nomura (*Proc. natn. Acad. Sci. U.S.A.*, **55**, 198; 1966) who both showed that protein-deficient 'core' particles could be reassembled to active 50S ribosomes. Now, however, the total reconstitution of *E. coli* 50S particles from protein and RNA has been achieved, by a two-step incubation procedure, and is reported by Nierhaus and Dohme in *Proc. natn. Acad. Sci. U.S.A.* (**71**, 4713; 1974).

Nierhaus and Dohme began by finding out how many proteins could be removed from the 50S particle before the resulting core particle became unable to regain its activity in the partial reconstitution procedure. Activity was measured both by the poly(U) assay, and by the 'fragment assay' for polypeptidyl transferase. They found that whereas 4 M LiCl cores could still regain activity, 5 M cores (containing only five proteins) had largely lost this ability, and 6 M cores (with only two proteins) could not be reconstituted at all. The obvious next step—a stepwise reassembly of 23S RNA to a 4 M core particle, and thence to a 50S ribosome—was not successful as judged by the fragment assay, although some activity in the poly(U) assay was recovered. Nierhaus and Dohme rightly interpreted this failure as an indication that the ionic conditions of the partial reconstitution procedure were not ideal for the early stages of total reconstitution.

They therefore mixed 23S RNA, 5S RNA and total protein, and investigated the effect of various incubations prior to the normal partial reconstitution. By optimising the conditions they arrived at a two-step procedure in which the isolated ribosomal components were first incubated together for 20 minutes at 40° C in 4 mM magnesium, 400 mM ammonium at *p*H 7.2, followed by the partial reconstitution incubation of 90 minutes at 50° C in 20 mM magnesium, 400 mM ammonium. This gave particles with a remarkably high activity, that is to say 80–110% in the poly(U) assay, and 40–60% in the fragment assay, as compared with native 50S sub-particles. Notably, no requirement for 30S particles or polyamines in the reconstitution mixture was observed. Phenol-extracted RNA and acetic acid-extracted proteins were used in the procedure, in order to ensure that the RNA fraction was entirely free from protein and the protein fraction entirely free from 5S RNA. This can therefore be regarded as a genuine total reconstitution, and should prove as advantageous to the understanding of the 50S particles as the corresponding reconstitution has already proved to the 30S. Detailed 'assembly mapping' of the 50S particle should now follow without too much difficulty.

Pituitary neuropeptides and behavioural processes

from A. Dickinson

THE idea that pituitary neuropeptides can influence behaviour by a direct action on the central nervous system is a recent one. These effects of pituitary hormones seem to be distinct from their well known actions on target tissues such as kidney and adrenal cortex; they resemble rather the actions on the CNS of steroid hormones secreted by endocrine target tissues.

The relation of pituitary neuropeptides to learning processes was one of the topics discussed at the fourth winter school of the European Training Programme in Brain and Behaviour research (January 4–11). Some of the strongest evidence for a direct action on the CNS comes from the work of the Utrecht group on the effects of adrenocorticotrophic hormone (ACTH) and related peptides on avoidance behaviour. In their experiments an animal is required either to make some response (active avoidance) or to refrain from responding (passive avoidance) in order to avoid an electric shock. They showed previously that injections of ACTH restored the deficit in active avoidance induced by hypophysectomy and prolonged active avoidance in intact animals during extinction. ACTH also improves passive avoidance acquisition. The important finding is that these behavioural effects seem to be independent of the adrenocorticotrophic activity of ACTH since the injection of ACTH 4-10, a fragment of the ACTH peptide chain which has no adrenocortical stimulating activity, produces comparable changes in avoidance behaviour.

Dr B. Bohus's report on this work made it clear that the facilitatory influence of ACTH was only seen while the hormone was present in the body. It was therefore suggested that the primary central effect of ACTH is to increase the general arousal or motivational state of the animal. Such a general effect is in line with biochemical studies reported by Dr W. H. Gispen (Institute of Molecular Biology, Utrecht) showing that the behaviourally effective fragments of ACTH seem to increase the incorporation of labelled leucine into almost all brain stem proteins of the rat.

Dr J. A. Gray of the University of Oxford reported a complementary series of experiments using learned appetitive responses rather than avoidance responses. After training approach responses by positively reinforcing them with rewards such as food and water he extinguished the responses by withdrawing the reward and found that ACTH 4-10 prolonged such extinction. Though at first sight his results seem to be comparable to those of the Utrecht group, it is not clear that the interpretation given above for the Utrecht results will explain those of Dr Gray. Withdrawal of a reward engenders emotional arousal such as frustration; such aversive arousal actually