et al. report remarkable progress with their crystals of unfractionated tRNA.

Their original observation, that mixed tRNA could be obtained in microcrystalline form, was remarkable enough (setting aside the assertion made some years ago by an eminent organic chemist that "microcrystalline" in the chemical literature is no more than a euphemism for "amorphous"). But in spite of the presence of discrete reflexions in the powder diagram, this work left open the possibility—or, as it seemed, the likelihood—that the material was a mixture of crystals, each containing a single tRNA species, rather than a homogeneous population of co-crystals, for it will be recalled that some tRNA chains are longer than others, and some even contain an additional vestigial loop on the "cloverleaf".

The continued labours of Blake *et al.* have now borne fruit in the form of crystals no less than 1.5 mm long, and altogether suitable for crystallographic analysis. They were prepared by the now standard procedure involving the progressive introduction of dioxan into the solution at the expense of water. A single crystal of this kind was assayed for acceptor activity, and was found positive for at least seven amino-acids. One of these was serine, which has a tRNA with the four-leaf clover structure; activities for another five amino-acids could not be demonstrated. It seems that the lattice can tolerate a measure of structural variation, although it would beg the central question to make any assumptions about how different or similar the structures corresponding to the known sequences could actually be. Certainly Blake *et al.* in the best pictures see a minimum spacing below 3 Å. The cell dimensions have been determined, and from the density of the crystals (corresponding to 50 per cent of water) and the partial specific volume of the tRNA, it emerges that the asymmetric unit is a single molecule, of which there are four in the unit cell. This provides the crystallographer with a highly favourable situation. The extensive topological similarity between different tRNA species is the first tangible result of this promising work. The quality of the X-ray data is already such that it should be possible forthwith to test various suggested structural models for tRNA.

BRAIN BIOCHEMISTRY

When Lipids are not Degraded

from a Correspondent

THERE was plenty to interest medical biochemists when the neurochemical and lipid groups of the Biochemical Society discussed the catabolism of complex lipids of the brain in London on December 17. The mammalian brain is rich in phospholipids and a complex array of glycolipids, but the enzymes responsible for their catabolism were poorly characterized until recently and there are still enough obscurities to keep neurochemists busy for many years.

The metabolic abnormalities in the major sphingolipid storage diseases have been elucidated in less than a decade, largely by the groups led by Dr R. O. Brady at the National Institute of Neurological Diseases and Stroke in Bethesda, and Professor H. Jatzkewitz at the Max-Planck Institut für Psychiatrie in Munich. The accumulation of lipids in the commoner sphingolipidoses is due to the absence of enzymes to degrade them. Thus, in Gaucher's disease, which

involves the accumulation of glucocerebroside deriving from senescent leucocytes, the glucocerebrosidase activity in tissues is only about 15 per cent of normal; in the infantile form of the disease the source of accumulation in neurones is probably the gangliosides. Both Dr E. H. Kolodny, who read Brady's contribution, and Jatzkewitz pointed out that the problem of Tay-Sachs disease is more complicated although it seems to involve an absence of a lysosomal hexosaminidase, which catalyses the cleavage of the N-acetylgalactosaminyl residue of Tay-Sachs ganglioside (N-acetyl-galactosaminyl)-(N-acetylneuraminyl)-galactosylglucosylceramide) (O'Brien, *Nature*, **224**, 1038; 1969).

In demyelinating diseases such as multiple sclerosis, the phospholipid lost to the greatest extent from the myelin is the ethanolamine plasmalogen (1-alkenyl-2-acyl-*sn*-glycero-3-phosphorylethanolamine). Dr G. B. Ansell (University of Birmingham) pointed out that in known demyelinating conditions there are greater than normal concentrations of the Mg²⁺-dependent enzyme which hydrolyses the alk-1-enyl linkage of this lipid and which is preferentially located in the crude mitochondrial fraction of white matter. In Alzheimer's disease (pre-senile dementia) there is also an increased amount of this enzyme associated with the loss of plasmalogen in sub-cortical white matter. Oddly enough, this enzyme does not attack choline plasmalogen, and the finding of Dr S. Gatt (Jerusalem) that the alk-1-enyl linkage of heart choline plasmalogen can be degraded by a thermostable factor present in the 100,000g supernatant fraction of a homogenate of rat brain provoked considerable interest. This process, if accompanied by a reduction of oxygen, is probably dependent on ferrous ions and is inhibited by ethylenediaminetetraacetic acid, *o*-phenanthroline and *a,a'*-dipyridyl. Its physiological significance is speculative so far.

Although Ansell gave some evidence for the presence in brain of phospholipases A₁ and A₂ active towards phosphatidylethanolamine, Dr G. R. Webster (University of London) provided much more detail about comparable enzymes which attack phosphatidylcholine. The A₁ enzyme has optimal activity at pH 4.2 compared with 5.5 for the A₂ enzyme (rat). A method for separation is suggested by the fact that the A₁ enzyme is thermolabile at pH 7.3, whereas the A₂ is stable up to 65° C at the same pH. There are highly significant amounts of A₁ in white matter.

PROTEIN SYNTHESIS

Making Enzymes in Test-tubes

from our Cell Biology Correspondent

ALTHOUGH cell-free systems which support protein synthesis are now part of the stock in trade of molecular biology laboratories, the enzymes that have been synthesized in cell-free systems and then shown to possess biological activity can still be counted on one hand. Any addition to the list is something out of the ordinary, particularly if the *in vitro* synthesis involves the transcription of DNA into messenger RNA as well as the correct translation of the mRNA into functional enzyme. Early last year, Gold and Schweiger (*Proc. US Nat. Acad. Sci.*, **62**, 892; 1969) reported the synthesis of β -glucosyl transferase in a cell-free system obtained from uninfected *E. coli* and programmed with