represent the first clear indications that the central organisation of disparity-detectors may be arranged into three pools, like the tripartite arrangement of colour-sensitive cones.

The sheep, or rather, the lamb, also provided some grist to a mill which was set turning in the last century by the arguments of Hering and Helmholtz about whether stereopsis is innate or acquired. Abnormal visual experience has been shown by numerous experiments, beginning with those of Wiesel and Hubel in 1963, to have enormously powerful effects in a number of mammalian species on cortical binocular connections, the very ones required for disparity-selectivity and therefore for stereopsis. However, controversy rages over the importance of normal visual experience during development, one contentious issue here being the degree of functional sophistication exhibited by visual cortical neurones when these have been examined in young, visually-naive animals by different groups of experimenters (reviewed by Blakemore). Differences of opinion about young animals may not be too surprising, in view of some of the changing ideas on adult binocular visual processing resulting from the technical advances mentioned above, and so a study of a young lamb's visual cortex is particularly welcome in the light of the relatively clear picture which seems to have emerged for the adult sheep. Clarke and V. S. Ramachandran (University of Cambridge), working with Whitteridge, provided some observations on the newborn lamb's visual cortex which might satisfy both Empiricist and Nativist points of view. Apparently disparity-selective binocular neurones, covering a wide range of different preferred disparities, are present in the second visual area of young lambs which have had no previous visual experience, in support of the Nativist view that some of the basic machinery for stereopsis is innate. On the other hand, one class of binocular neurones, dubbed 'AND' gates because they respond only to simultaneous binocular stimulation, seemed to be absent from the visually-naive lambs, suggesting that visual experience is important for the development of these more sophisticated processors of binocular information. The underlying connectivity responsible for a binocular 'AND' gate is not clear, but the view that they represent a higher level of binocular information processing and the view that they may require visual experience for their development received support from a rather unexpected quarter at the meeting, from work on the owl's visual system.

That owls have any binocular visual processing at all should come as something of a surprise to some workers, who have pointed out that, as in other birds, all the information from each eye of the owl crosses to the opposite side of the brain. Birds do not have partial exchange of information at the optic chiasm like that which permits binocular interaction in mammals. At the meeting J. D. Pettigrew (Caltech) described how the owl achieves binocular visual processing with a second optic chiasm, which permits a bilateral projection from the thalamus to the Wulst, a forebrain structure where there are binocular visual neurones almost indistinguishable from those found in mammalian visual cortex. The convergence of function in owl Wulst with that found in cat, monkey, and sheep visual cortex was particularly surprising in view of differences both in the arrangement of the visual pathway, and in the morphology of the neurones involved, since the owl Wulst, to take one example, lacks the pyramidal neurones with long apical dendrites which characterise mammalian cortex. Not only were all the various classes of neurones with orientation-sensitivity, length-sensitivity, disparity-sensitivity, and so on, represented within the Wulst, these neurones were also very sensitive to early visual experience. Particularly sensitive to experience are the binocular 'AND' gate neurones, which are located in the superficial laminae of the Wulst and therefore probably identifiable with the output neurones seen anatomically at the highest level of processing.

Further study of the properties of higher-order binocular neurones such as the 'AND' gate neurones, as well as

Methanogenic bacteria

THE question of whether methanogenic bacteria might constitute a third form of life has received considerable coverage recently in the scientific press[1,2]. The two publications which initiated this discussion[3,4] present oligonucleotide catalogues of the small-subunit ribosomal RNA from 10 species of methanogens and argue from these and other data that the methanogens represent a primary kingdom distinct from the typical bacteria (eubacteria) and from the eukaryotes. In the comparison of the various 16S and 18S ribosomal RNA sequences, however, one salient point seems to have escaped notice.

I refer to the only portion of the ribosomal RNA whose role in the translation process has been identified. Over the past four years there has accumulated substantial evidence that messenger RNA binding to the *Escherichia coli* ribosome is mediated in part by base pairing between a pyrimidine-rich sequence near the 3′ end of 16S rRNA and a purine-rich region preceding the initiation triplet[5,6]. Examination of the current collection of over 40 different initiator regions from phage and *E. coli* mRNAs (see ref. 6 for a partial listing) reveals that the rRNA sequence CCUCC is most consistently utilised in this important RNA·RNA interaction. All other species of eubacteria analysed so far seem to retain at least four of these residues in a comparable position near the 3′ end of their 16S rRNAs[7,8].

Newly determined sequences of 18S rRNAs from six species representing diverse branches of the eukaryotic kingdom also show strong homology to *E. coli* 16S rRNA in the 20 residues at the 3′ end[9–11]. However, in every case the entire CCUCC sequence is deleted, suggesting that the eukaryotic ribosome has evolved an alternative mechanism for specific recognition of mRNA initiator regions.

Fox *et al.*[3] show that 16S rRNAs from all 10 species of methanogens possess the 3′ terminus AUCACCUCCU$_{OH}$. This sequence contains the prototypical and functionally important CCUCC and is conserved despite variations in virtually all other large 16S oligonucleotides. Thus, it is difficult to concur with Woese and Fox[4] that "there is no reason at present to consider methanogens closer to eubacteria than to the 'cytoplasmic component' of the eukaryote." Rather, a high degree of functional relatedness between the methanogenic and other 16S rRNAs is indicated.

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