species. Presumably AUA is never used to code isoleucine in *E. coli*, for example.

Redundant *t*RNAs occur which have different physical properties and so can be separated, but they have the same anticodon. Also the relative amounts of the different species of *t*RNA vary and this is obviously one way in which translation could be regulated. Indeed, Nirenberg and Anderson are apparently about to publish some definite evidence for this suggestion.

One of the four cysteine *t*RNA fractions in *E. coli* responds to the codon UGA as well as UGU and UGC. As there is evidence that UGA is a chain terminator like amber and ochre codons, this cysteine *t*RNA may be a UGA suppressor. On the other hand, if this *t*RNA in fact translates UGA as cysteine, a cell-free system programmed with poly GAU should produce some poly cysteine because one of the three ways of translating poly GAU is as GA(UGA, UGA)$_n$, but according to Khorana's group this never occurs. This suggests that UGA and the cysteine *t*RNA might possibly act as a block to protein synthesis rather than a chain terminator and suppressor system.

NEUROPHYSIOLOGY

Leech Neurones

from our Neurophysiology Correspondent

THE medicinal leech, *Hirudo medicinalis*, has suddenly become popular as an experimental animal for neurophysiology. Kuffler (*J. Neurophysiol.*, **27**, 290; 1964) used it because leech glial cells are large and easy to identify in a living preparation; now Nicholls and Taylor have investigated the properties of some neurones in the leech central nervous system (*J. Neurophysiol.*, **31**, 740; 1968). One satisfying aspect of their work is that they find the drawings by Retzius of leech neuroanatomy accurate enough to be used as a guide to the connexions between individual neurones. The leech is made up of almost identical segments, each divided into five annuli by markings on the skin. Its CNS contains segmental ganglia, which are alike, except for a few, larger than the rest, in the most posterior and anterior segments. Action potentials have been recorded intracellularly from many of the cell bodies in the segmental ganglia, but with a few exceptions these are less than 30 mV in amplitude, suggesting that in general they do not actively invade the soma. The fourteen identifiable cells in each ganglion, which have action potentials larger than 60 mV and undershoot the resting potential by as much as 15 mV, have been studied by Nicholls and Taylor.

All are responsive to mechanical stimulation of the skin. T cells, of which there are three on either side of each ganglion, respond to light touch—for example, water currents in the leech's environment; they adapt rapidly to continuous pressure, but give a sustained discharge to a moving stimulus. P cells require greater pressure, but adapt slowly; N cells, of which, like P cells, there are two on either side of each ganglion, can only be stimulated by quite radical deformations of the skin and may give a maintained discharge even after removal of the stimulus. Simultaneous recording from nerve roots containing the T, P and N axons and from the cell bodies themselves showed that action potentials produced by skin stimulation occurred in the roots before the cell bodies. Further, they were not blocked by bathing the preparation in Mg^{++} rich Ringer solution, which would block chemical synapses within the ganglia. This makes it very likely that T, P and N are primary sensory neurones, unless there are peripheral synapses which were not blocked by the Mg^{++}.

Each neurone has a clear receptive field which overlaps slightly with those of its homologues in the same and adjacent segments. There is less overlap between areas innervated by axonal branches of the same neurone. The authors find that the receptive fields bear a constant relation to visible landmarks on the skin, so there appears to be considerable specificity in the organization of individual sensory neurones in the leech. This seems to be a common feature of nervous systems in which individual neurones can be recognized anatomically, while in more complex nervous systems, although the overall pattern may be specified genetically, all individual connexions clearly are not.

RIBOSOMES

Another Red Herring

from our Cell Biology Correspondent

THE idea has been discredited twice recently that chloramphenicol particles (CM particles)—the associations of 16*S* and 23*S* ribosomal RNA with protein, which are produced when exponentially growing *E. coli* are fed chloramphenicol—are incomplete ribosome precursors and that their protein is ribosomal protein. In the latest issue of *J. Mol. Biol.* (**37**, 119; 1968), Schlief reports that most of the protein found in the CM particles is non-ribosomal. Earlier this year in the same journal (**33**, 559; 1968), Yoshida and Osawa, who had been among the chief proponents of the CM particle idea, reached the same conclusion and retracted their earlier assumptions. They decided that CM particles have nothing to do with the maturation of ribosomes.

Yoshida and Osawa, using a double labelling technique, first confirmed earlier observations that the protein components of the 18*S* and 25*S* CM particles are derived from pre-existent protein, synthesized before the addition of chloramphenicol. They then set about proving that *in vivo* the RNA component of the particles exists free of protein and that its association with protein is an artefact of the extraction techniques used. In essence, they showed that when cells grown in the presence of labelled amino-acids but in the absence of chloramphenicol are mixed with cells grown for 20 min in the presence of chloramphenicol and ^3H uridine (to label the RNA) and then extracted, CM particles containing labelled RNA and protein are produced. This means that labelled RNA from one cell binds labelled protein from another during the extraction procedure and that the particles are thus artefacts.

Analysis of the proteins isolated from the 18*S* and 25*S* CM particles by polyacrylamide electrophoresis and column chromatography revealed that the bulk of the protein of the 18*S* particles is not found in the 30*S*