(EAMG) induced by immunisation with purified *Torpedo* receptor. If, however, the receptor is denatured before administration it does not result in EAMG and can delay, prevent or even reverse the EAMG produced by the native receptor. One possible explanation is that the antibody to the denatured receptor competes with that for the native form for binding to the muscle acetylcholine receptors of the experimental animals. The other therapeutic approach outlined by Fuchs is to try to supplement artificially the natural antibodies (anti-idiotypic antibodies) against the anti-acetylcholine receptor antibody with the intention of neutralising the harmful effects of the latter. Promising anti-idiotypic antibodies have been produced (see next week's *Nature* **273**, 543; 1978) but not yet in high enough titres for their efficacy to be tested on EAMG.

Although the behaviour of acetylcholine conforms with that expected of a classical neurotransmitter, the neuropeptides move in more mysterious ways. What for example is substance P doing co-existing with 5-hydroxytryptamine in the neurones in the brain stem (T. Hokfelt, Karolinska Institute)? And where does that leave Dale's principle (although Hokfelt questioned its authenticity) of one neutrotransmitter per neurone.

A suspicion, but no more than that, of a new brain peptide came out of the work of C. Schaller (European Molecular Biology Laboratory) on *Hydra*. She has partially purified several morphogenetic substances from *Hydra* including a head activator that seems to be a neuro-secreted peptide. Using the *Hydra* bioassay that was developed for the head activator Schaller has now discovered bioactivity in extracts of mammalian hypothalamus and intestine.

Oxytocin and vasopressin are peptide hormones that are synthesised in neurones of the supraoptic nucleus and paraventricular nucleus together with their individual carrier proteins, the neurophysins. M. Brownstein (National Institutes of Health) reported evidence that indicated the synthesis of both neurophysins in large precursor forms with sequential processing during their axonal transport to the posterior pituitary. The availability of Brattleboro rats that lack vasopressin and its associated neurophysin allowed the two neurophysins and their precursors to be distinguished. The way is now clear to determine whether, as is suspected, one precursor contains oxytocin and the other vasopressin, in addition to the respective neurophysin.

Even the more classical amine and amino acid neurotransmitters are looking considerably less classical these days. J. Glowinski (College de France) outlined evidence gleaned from the use of push—pull cannulae inserted into regions of the brains of anaesthetised cats, that clearly demonstrated the physiological and functional release of dopamine from the dendrites in the substantia nigra of neurones whose terminals released dopamine in the striatum. The dendritically-released dopamine functions as a neuromodulator through presynaptic receptors on a variety of neurones, including dopaminergic neurones themselves. Further experiments showed an intriguing reciprocal relationship between the nigrostriatal dopaminergic pathways of the two halves of the brain. For example, light flashes to the right eye resulted in increased release of dopamine from the ipsilateral striatal terminals with decreased release in the corresponding substantia nigra accompanied by just the opposite effects in the contralateral pathway. How this happens is not known but an involvement of the dendritically released dopamine is suspected.

Further complexity is introduced into the study of 'neurotransmitter' roles when account is taken of retrograde transport. That is, for example, the transport of glycine—a probable transmitter—from the nerve terminals in the tectum of the pigeon where it is picked up, back to the cell bodies in the isthmi pars parvocellularis nucleus, (M. Cuénod, University of Zurich). Does it deliver a message? And equally does the quintessential neurobiological molecule, nerve growth factor (NGF), deliver a message to those parts of the neurone to which it is transported retrogradally along the smooth endoplasmic reticulum after internalisation at the nerve terminals (H. Thoenen, Biozentrum, Basel)? The answer for NGF is much more certainly yes than it is for glycine.

NGF is a specific growth factor for sympathetic neurones. A new model system for investigating its mode of action is a clonal cell line (PC12) derived from a transplantable rat adrenal medullary pheochromocytoma. In response to NGF, PC12 cells stop dividing, extend long neurites and become electrically excitable. P. Calissano (Harvard Medical School) presented tentative evidence for the internalisation of NGF by PC12 with the possibility that it reaches the nucleus. Calissano proposed that internalisation first allows NGF to interact with actin filaments—which it does *in vitro* to form stress fibre-like paracrystals—resulting in neurite extension. And then some NGF would reach the nucleus where it would interact with the tubulin—which it does *in vitro* to

Why subduction volcanism varies

from Peter J. Smith

REGIONS above the descending oceanic lithosphere are associated with high heat flow and active volcanism, as is well known. Conventional wisdom has it that these phenomena are caused by frictional heating in the slip zones of descending plates or by upwelling of hot mantle material induced by descending plates. But Ito (*J. geophys. Res.* **83**, 262; 1978) claims that neither hypo hesis can explain all the relevant petrological and geophysical observations. In island arcs, for example, volcanism results predominantly in andesites and (to a lesser extent) dacites, but in some cases also in basalts. So why, asks Ito, should some volcanic centres be involved in this 'bimodal' eruption?

To account for such puzzling phenomena, Ito follows Jischke (*J. geophys. Res.* **80**, 4809; 1975) and others in appealing to a model in which there is, in the slip zone between a descending plate and the overlying asthenosphere, not only fluid produced by partial remelting of subducted oceanic crust (in the lower regions) but also liquid drawn from the asthenosphere by suction (in the upper reaches). Where the new model differs from the old, however, is in assuming the density of the liquid-enriched fluid to be up to 10% lower than that of the asthenosphere and, more importantly, its viscosity to be much lower (perhaps as low as 10 g $cm^{-1}s^{-1}$). The consequence of these crucial differences, as Ito shows at length mathematically, is an upward flow.

Support for the validity of Ito's basic assumption comes from seismic data obtained by Okada (DSc Thesis, Hokkaido University, 1977) who claims to have detected a thin low velocity layer along the upper edge of the plate descending beneath Japan. But be that as it may, Ito's model leads to an obvious explanation of the occurrence of both andesites and basalts in regions of the Earth's surface above descending plates. The former could result from partial remelting of subducted oceanic crust, as is commonly supposed, whereas the latter could be derived from the liquid drawn from the asthenosphere.

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