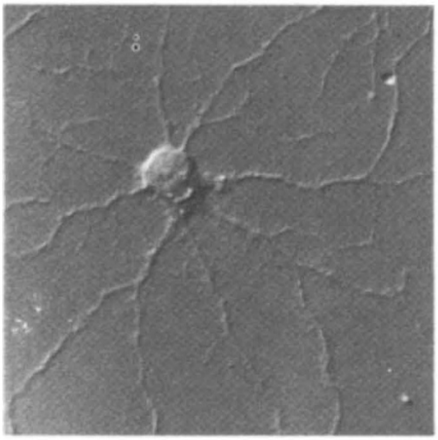
Although the biophysical results are of interest, the presence of glutamate-activated ion channels on type 2 astrocytes has a broader neurobiological significance. The type 2 astrocyte (see figure), first described by Raff and colleagues[5,12], has been found only in white matter (whether an equivalent type exists in grey matter is still unknown). As can be seen from the figure, its stellate appearance in culture is somewhat neuronal, a resemblance further supported by its surface antigens[5] and ion channels[13]. *In vivo*, the processes of this cell are closely apposed to nodes to Ranvier[14,15].

Thus if glutamate receptors on type 2 astrocytes are extrasomatic (as is the case in neurons), then type 2 astrocyte perinodal processes can easily sense any potential glutamate release at nodes during impulse activity. Such release could be mediated by a non-vesicular carrier mechanism as vesicle fusion has not been observed along axons or nodes. Although glia might also be the source of the released glutamate — because they have electrogenic glutamate uptake that could run in reverse[8,9] — this is unlikely as they also contain cytoplasmic enzymes that rapidly metabolize glutamate. (In either case, it remains to be shown that electrogenic glutamate-carrier mechanisms can mediate net glutamate release *in vivo*.)



A type 2 astrocyte in culture.

Marrero *et al.*[1] suggest that axons release transmitters which can alter the properties of glial ion channels. They record from glial cells at the surface of the frog optic nerve using the loose patch-clamp technique, which allows voltage-clamp recording when gigaohm-seal patches cannot be obtained, and observe sodium currents, probably originating from glial cells (although an axonal contribution is not completely excluded). Axonal impulses alter these sodium currents by shifting their current–voltage relation in a hyperpolarizing direction. One possible explanation for the effect is the impulse-dependent release of an unidentified chemical factor from axons; more likely, however, is a change in local ionic concentrations, as the authors suggest.

New evidence that glutamate mediates axon-to-Schwann-cell signalling in the squid giant axon[16] more strongly supports the idea of non-synaptic axonal release of neurotransmitter. These Schwann cells have non-NMDA glutamate receptors that are activated during nerve stimulation: impulses elicit a Schwann-cell depolarization that is blocked by specific glutamate antagonists. The main transmitter present in the axons of this invertebrate preparation is glutamate; its high concentration strongly implicates the axons as the source of the released glutamate.

Why would neurons want to activate glial channels during impulse activity? Usowicz *et al.* suggest that activation of glutamate receptors could alter local concentrations of sodium and potassium near the node, altering excitability. Alternatively, glutamate-induced depolarization could activate the voltage-dependent calcium channels also present in type 2 astrocytes[13]; this could in turn alter local calcium concentrations or affect release of glial neurotransmitters. Another hypothesis proposes impulse-dependent release of humoral substances from axons that activate glial chloride channels as part of a potassium homoeostatic mechanism[13]. In any case, these novel glial channels suggest the existence of dynamic neuronal–glial signalling processes in parts of the nervous system long thought to be passive transmitters of information. Whether such signalling simply allows glial cells better to fulfill a role of servitude to neurons, or instead functions in information processing, is now a significant question. □

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DAEDALUS

Plastic wood

Wood is one of the fast-vanishing resources of the planet. The rain forests are being destroyed largely because of the industrial world's demand for timber. And yet much of this wood (small branches, offcuts and so on) is wasted, and much of the rest is used for transient structures like shuttering. Almost none of it is recycled. Daedalus contrasts this sad state of affairs with the active recycling of metal scrap. Unlike the metals, wood cannot be melted and re-cast into new bulk material.

But wood is not totally intractable. It can be softened and bent even by steam — hence such charming artefacts as the traditional bentwood chair. At higher temperatures, of course, it starts to decompose: an exothermic runaway process. Daedalus plans to control and limit this reaction by conducting it in pressurized water (whose critical temperature of 374 °C is well above the charring-point of wood). As the temperature rises, the wood should slowly soften and depolymerize to the point of melting, or at least of plasticization. Under the right conditions, this controlled hydrolysis and depolymerization should be almost perfectly reversible, like the thermal depolymerization of many plastics.

So DREADCO's engineers are submitting all sorts of wood samples to controlled cycles of heat and pressure in various aqueous media. Their ultimate goal is a process which will take in scrap wood, soften it to high plasticity, and then roll it out or extrude it into fresh baulks and planks of timber. Much of its grain and structure should survive, giving a product that is recognizably wood, and which still has the outstanding structural virtues of the original. Indeed, it may be even better — free of cracks and knot-holes and available in shapes and sizes impossible for any tree.

Thus the destructive profligacy of modern timber technology will be checked. Sawdust, demolition wood-waste, offcuts, shuttering and timber scrap of all kinds will all be wonderfully recycled into new good wood. Some scrap (like old desks and grand pianos) may need a melt–filtering step to remove nails and metal wire, but with good luck almost all the world's wood could be recovered for re-use.

Even better, quite new methods of fabrication will open up. Complex items like wardrobes and bookcases could be moulded, in one operation, from plasticized wood. New materials like wire- or fibre-reinforced wood may become possible; even foamed wood, combining lightness and rigidity with thermal insulation. And subtle wood 'alloys', intimate mixtures combining the strength of spruce with the finish of mahogany, or the suppleness of bamboo with the durability of teak, should be possible.

David Jones