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or neurodegeneration, as in Alzheimer's and Parkinson's diseases.

Song *et al.*'s discoveries[2] may lead to a better understanding of how neurogenesis could be stimulated. The authors isolated neural stem cells from the hippocampus of adult rats, and engineered the cells to express green fluorescent protein (GFP), allowing them and their progeny to be easily traced. After culturing the stem cells with astrocytes from the hippocampus of newborn rats, Song *et al.* found that the rate of neurogenesis increased more than eightfold. By contrast, GFP-labelled stem cells cultured with fibroblast cells or purified neurons did not change their rate of neurogenesis. Next, the authors showed that astrocytes derived from the adult hippocampus could also increase neurogenesis, albeit with less efficiency than hippocampal astrocytes from newborn rats. The astrocytes appeared to work by increasing the rate of proliferation of the stem cells and steering their progeny towards becoming neurons, rather than simply enhancing the survival of new neurons.

Is this feature common to all astrocytes? To find out, Song *et al.* purified astrocytes from the spinal cord of newborn and adult rats — a region that does not normally show neurogenesis *in vivo*. The spinal-cord astrocytes from newborns had only small effects on neurogenesis from hippocampal stem cells; adult spinal-cord astrocytes had no effect. So there is significant regional specificity in the ability of astrocytes to induce neurogenesis.

Song *et al.*'s demonstration that astrocytes can control the proliferation of hippocampal stem cells accords with previous studies that used stem cells from other brain regions. For example, astrocyte fragments can modulate the proliferation of stem cells from the cortex of developing rats[3], and astrocyte monolayers can increase neurogenesis from adult subventricular-zone stem cells[4]. What is new and fascinating about Song *et al.*'s work is that it shows that astrocytes can direct the fate, as well as the proliferation, of hippocampal stem cells, inducing their progeny to become neurons rather than glia — and that this depends on using astrocytes from neurogenic brain regions.

One rather simple explanation for Song *et al.*'s regional-specificity results is that the spinal cord contains older astrocytes than the hippocampus, which constantly renews at least some of its astrocytes. (In fact, the neuron-producing hippocampal stem cells may even be astrocytes[5].) In support of this idea, newly generated astrocytes can increase the growth of neuronal extensions (neurites), whereas older astrocytes cannot[6]. But whatever the explanation, it should be possible to dissect the mechanisms underlying the ability of astrocytes to control neurogenesis.

For example, researchers could use microarray technology to identify which genes are expressed differently in those astrocytes that can and cannot promote neurogenesis. Hot candidates might be genes encoding molecules similar to Noggin, which is known to be released from the ependymal cells lining the ventricles of the brain. Noggin can induce neurogenesis from subventricular-zone stem cells, both *in vitro* and following grafting into the brain, by inhibiting glial signalling pathways involving bone morphogenetic proteins (BMPs)[7]. As Song *et al.* mention, if neural stem cells are taken from the spinal cord and grown in culture, they can produce small numbers of neurons. This suggests that neurogenesis-inhibiting factors such as BMPs may be present in intact spinal cords. They may also be present in astrocyte cultures generated from the spinal cord, perhaps explaining why such astrocytes cannot promote the proliferation of hippocampal stem cells.

It is also interesting that stem cells generated from different regions of human and rodent embryonic brains retain their regional specificity. Those from the forebrain generate more neurons than those from the hindbrain and have distinct gene-expression patterns, even after long periods in culture[8,9]. It remains to be seen whether this regional specificity of stem cells is due to their control by regionally specific astrocytes, but Song *et al.*'s paper makes it an intriguing possibility.

Another question is whether it might be possible to enhance brain repair simply by exposing stem cells that do not normally make neurons to 'neurogenic' astrocytes. An obvious way of finding out would be to transplant hippocampal astrocytes into a damaged spinal cord, and to see whether spinal-cord stem cells then produce neurons. Whatever the results, there will certainly be a complex interaction between the intrinsic gene-expression patterns of the stem cell, and environmental cues such as those produced by astrocytes. The 'nature versus nurture' debate has never been more interesting

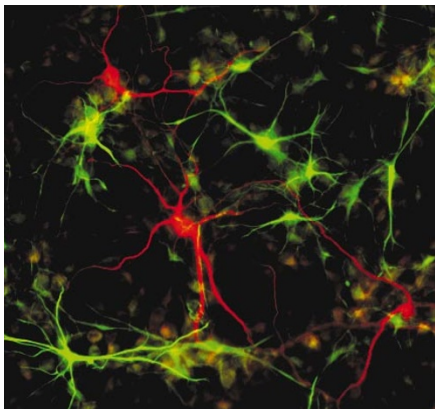

Figure 1 **More than just glue. Glial cells such as astrocytes (green) were once thought to have a purely supportive role in the brain. But more recent work, including the paper by Song *et al.*[2], tells a different story. The image shows neurons (red) and astrocytes, derived from mouse neural stem cells.**

100 YEARS AGO

In the *Proceedings* of the American Philosophical Society for December 1901 (vol. xl. No. 167), Mr. Percival Lowell refers at some length to the observations that led to the announcement in the Press that Mars had been signaling to the earth on a night in December 1900. It may be mentioned that the *original* dispatch read as follows:— "Projection observed last night over Icarium Mare, lasting seventy minutes." (Signed) "Douglas." In the present paper Mr. Lowell describes in detail some of the individual observations, and points out how the Flagstaff observations of 1894 showed that on general principles the Martian projections were most probably not due to the existence of mountain peaks. A close study of the surface markings led both Messrs. Lowell and Douglas to the result that these several projections were not caused by such permanent suface markings as mountains, but were the effect of clouds floating in the planet's atmosphere… Mr. Lowell, in his concluding remarks, says that the surface marking, Icarium Mare, is undoubtedly a great tract of vegetation, and the observation of December is completely explained if it be assumed that a cloud was formed over this region and rose to a height of thirteen miles, and then, traveling east by north at about twenty-seven miles an hour, passed over the desert of Aeria and there was dissipated.
From *Nature* 1 May 1902.

50 YEARS AGO

A new field of the application of television was opened up about a year ago when, at the request of the admiralty, Marconi's Wireless Telegraph Co., Ltd., hurriedly assembled a television camera chain in an attempt to find the lost submarine *Affray*. A great deal of development work has since been carried out in co-operation with Siebe, Gorman and Co., Ltd.; and recently (April 17) a demonstration of the newly designed equipment was given in an experimental tank at the works of this Company. Among the special features of the apparatus shown were the use of the extremely sensitive image-orthicon camera tube, the enclosure of this camera and its associated components in a chamber capable of withstanding the water pressure prevailing at great depths, and the provision of remote-control facilities whereby the camera may be focused and directed by the operator who remains on the ship above.
From *Nature* 3 May 1952.