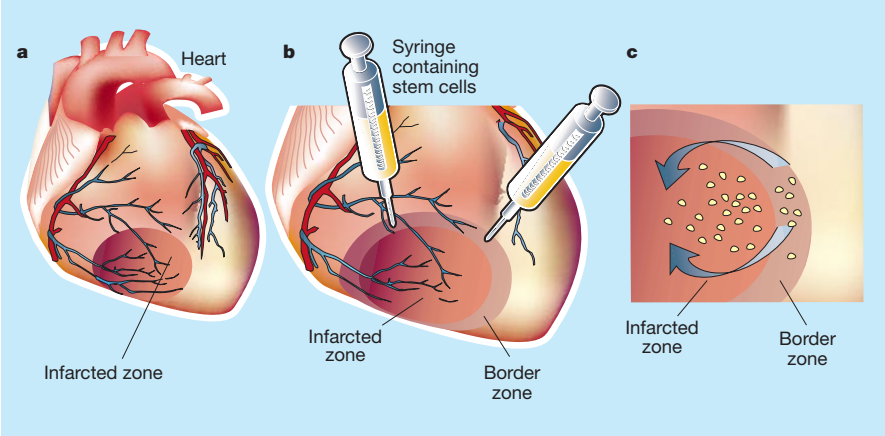

Figure 1 **Repairing damaged heart tissue with bone marrow cells, as shown by Orlic *et al.*[1]. a, Ligation of the coronary arteries in a mouse heart causes loss of blood flow to a region of the heart, resulting in 'infarction' — damage to that part of the heart. b, Multipotent cells derived from the bone marrow of healthy mice are injected into the undamaged region (the border zone) surrounding the infarct. c, The bone marrow cells infiltrate into the damaged region, and start to express characteristics of heart muscle cells (cardiomyocytes), the smooth muscle that forms blood vessels, or the endothelial cells that line the vessel walls. Cardiac function improves.**

doing just that in mice. They identified multipotent cells by the fact that they expressed on their surface a protein called c-Kit, but did not express the Lin protein. This combination of markers defines the multipotent population. (Very early, truly unspecialized multipotent cells are known as stem cells; whether or not the cells identified by Orlic *et al.* are stem cells remains controversial, but they are certainly multipotent.)

The authors isolated their donor cells from mice that had been engineered to express green fluorescent protein, so the cells could be readily identified when introduced into recipient mice that did not express that protein. Hearts of the recipient mice were damaged by ligation of the coronary arteries, causing loss of blood flow to a region of the heart-muscle wall, and localized tissue damage. After a few hours, the authors transferred donor multipotent cells into healthy tissue surrounding the dam aged area (Fig. 1).

Within nine days, the transferred cells took up residence in the heart and showed remarkable adaptations to their new environment. Over half of the damaged area was filled with cells showing characteristics of cardiomyocytes, the smooth muscle that makes blood vessels or the endothelial cells that line the vessels. In other words, the transferred cells appeared to be differentiating to form the three major cell types needed to repair the heart. Orlic and co-workers also detected proteins associated with the activation of muscle-specific gene expression, indicating that some of the transferred cells were indeed on the path to becoming functional cardiomyocytes. New cells in the damaged region continued to multiply, and cardiac function improved. The implications are profound: damage to the heart muscle after a heart attack might be reparable with specific bone marrow cells.

Predictably, these exciting observations raise a plethora of questions. The transferred cells may have expressed proteins that indicate they were adapting to the heart environment, but would the cells function properly after they had differentiated fully? Are the donated cells capable of establishing the architecture needed to form a functional myocardial wall? Can they repopulate scar tissue that forms within weeks or months after a heart attack, rather than only a few hours after loss of blood to a particular region? How long can the donated cells survive and continue to proliferate? And do these cells contribute directly to the recovery of the recipient heart, or do they merely stimulate the function of the undamaged heart tissue?

The search for cardiac stem cells has long occupied cardiovascular researchers hoping to find a way to replace damaged heart tissue. Such cells may not exist within the heart, but perhaps instead have been hiding within bones, masquerading as members of the blood-producing lineage. The challenge now will be to find out just how well these multipotent cells can perform new tricks in their new homes. Perhaps one day people suffering from heart failure might be treated so effectively that, as songwriter Paul Simon envisaged, "Their hearts and their bones can't be undone." ■

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100 YEARS AGO

MR. H.G. Wells commences, in the current number of the *Fortnightly Review*, a series of speculative papers upon some changes of civilised life and conditions of living likely to occur in the new century. To construct a prehistoric animal from one or two fossil bones is a much easier task than the prediction of future developments from the point of view of the present; but Mr. Wells attempts to do this ... The subject of the first article is land locomotion in the twentieth century, and it scarcely requires a prophetic afflatus to know that the present systems will be largely superseded or modified. Horse traffic, with its cruelty and filth, while the animals exhaust and pollute the air, must give place to motor carriages in a few years. The railways will then develop in order to save themselves. There will be continuous trains, working perhaps upon a plan like that of the moving platform of the Paris Exhibition, or utilising the principle of the rotating platform outlined by Prof. Perry in these columns ... Nothing is said about the possibilities of aeronautics, not because of any doubt as to its final practicability, but because "I do not think it at all probable that aeronautics will ever come into play as a serious modification of transport and communication."

From *Nature* 4 April 1901.

50 YEARS AGO

***Annual Review of Plant Physiology*. It is, perhaps, inevitable that, in a volume of 364 pages, a few errors should have escaped the diligence of the proof readers. Apart from trivial errors of spelling which will scarcely overtax the ingenuity of the informed reader, the generic name *Hibiscus* is spelt in a way which might surprise Virgil and Linnaeus (p.126). There is no real ambiguity in the use of the symbol O^{-2} for the oxygen anion (p.325); but it might have been helpful to distinguish on p.55 between published and unpublished data. It would be the height of folly, however, to attempt to judge the quality of fruit merely by inspection of the surface bloom. It would indeed be difficult to over-estimate the very great debt which we owe to the promoters of this new "Review". There is little doubt that the new series here inaugurated will prove indispensable to all those interested in the growth of plants.**

From *Nature* 7 April 1951.