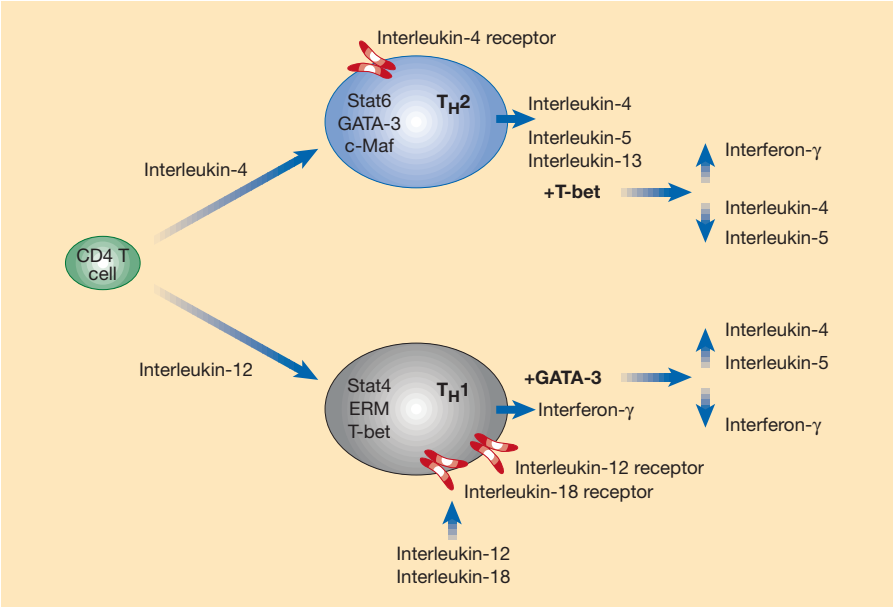

Figure 1 **Driving T-helper-cell commitment. The cytokines interleukin-4 and interleukin-12 direct the development of, respectively, T-helper-2 (T_H2) and T_H1 subsets from a naive T cell. (Expression of the protein CD4 defines a subset of T cells, including the naive T-helper cell.) Acting through the transcription factors Stat6 and Stat4, these cytokines lead T_H2 cells to produce interleukins 4, 5 and 13, and T_H1 cells to produce interferon-γ. T_H2 cells express the transcription factors c-Maf and GATA-3. c-Maf activates the expression of the interleukin-4 gene. Expression of GATA-3 in developing and committed T_H1 cells induces the expression of a wide array of T_H2-specific cytokines and inhibits interferon-γ production. Szabo *et al.*[7] have now identified T-bet, a T_H1-specific transcription factor that is induced by interleukin-12. T-bet itself induces expression of interferon-γ and represses expression of interleukins 4 and 5 in both developing and committed T_H2 cells.**

subset occurs after repeated stimulation under T_H1-specific or T_H2-specific culture conditions[18]. Szabo *et al.* next introduced T-bet into such stably committed T_H2 populations. They found that the number of cells producing interferon-γ increased, and the number of interleukin-4- and interleukin-5-producing cells decreased (Fig. 1). It seems that T-bet can convert even committed T_H2 into T_H1 cells.

However, introduction of T-bet into a more long-term, unvarying T_H2 clone increased the number of interferon-γ-producing cells only slightly, perhaps because T-bet could no longer access the relevant genes, or because the array of factors necessary for inducing expression of the interferon-γ gene was no longer present. Yet T-bet expression in this clone still res-ulted in a significant reduction in the number of interleukin-4- and interleukin-5-producing cells, so T-bet's ability to suppress T_H2 development extends even to long-term clones.

All of this means that T-bet both initiates T_H1 developmental programmes and represses the opposing T_H2 programmes. This effect of T-bet ties in nicely with the ability of GATA-3 to repress interferon-γ in T_H1 cells[11–14] while simultaneously inducing T_H2-specific cytokines[9–14]. Also, like T-bet, GATA-3 affects the differentiation of even committed T-helper cells[14] (Fig. 1). So, the balance of T-bet and GATA-3 ultimately determines the fate of a developing T-helper cell. These findings should lead to further insight into the molecular mechanisms that direct lineage commitment in the immune system, and may also provide scope for therapeutic intervention. In the meantime, we need to know what determines the relative prominence of these two important T-helper aides. ■

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Daedalus

Rain, rain, go away

The cork in a wine bottle, says Daedalus, is an extremely cunning invention. It exploits the simple fact that cork swells in high humidity. The inner end of the cork, sealing the airspace over the wine, is at well over 90% humidity. So once in place, the cork swells and seals the bottle perfectly.

Daedalus is now applying this elegant principle to paint. In rainy Britain, every exposed wooden surface must be painted to stop it rotting. But no paint is totally impermeable to water or its vapour. It merely slows the rate at which the wood takes up or loses water. This is useful because even in Britain it rains only 5% of the time. A coat of paint prevents the wood imbibing a great draught of water every time it rains, and keeps its water content in balance with the average humidity. This is usually low enough to discourage rot.

But Daedalus is going beyond such purely passive barrier films. His new paint will let water out much more easily than it gets in. It will be inherently porous; but, like cork, it will swell in high humidity, sealing its pores against the ingress of water. Conversely, in hot or dry weather it will shrink, and its pores will open to let water vapour out easily. It will be an active water-pump, keeping a wooden surface drier on average than the air around it.

DREADCO's 'Pumpaint' will combine air-polymerization and emulsion-paint technology. It will consist essentially of a suitable monomer dissolved or suspended in excess water. When the paint is applied to a wooden surface, its monomer component will set quickly. As its water later evaporates, the polymer will dry out, shrinking into a microporous film. In humid conditions, it will take up water vapour again and re-expand to a homogeneous barrier. This constant stretching and shrinking risks peeling it from the wood beneath. It will have to bind itself firmly by chemical reaction.

Pumpaint will lay to rest the humidity paranoia of British builders, joiners and carpenters. They will enjoy once more the craftsmanship and feel of wood, and the elegance of its products. The dour advance of PVC, whose only advantage is that it does not rot, will be halted. And many noble ancient houses, steadily sabotaged by their deteriorating woodwork, may yet be saved. **David Jones**

The Further Inventions of Daedalus **(Oxford University Press), 148 past Daedalus columns expanded and illustrated, is now on sale. Special *Nature* offer: m.curtis@nature.com**