kg m^{-2}) with those of W. H. S. (ref. 3; see table) suggests that they did not include changes in soil carbonate–carbon in their assessment. Loss of desert land may be accompanied by the degradation and loss of soil carbonate with the carbon transferred to inorganic pools in the atmosphere or the oceans. As the carbonate pool is 10 times larger than the pool of soil organic carbon in deserts, the actual global increase in carbon storage due to the decrease in desert area may be significantly less than the figure reported by Adams *et al.*[2]. Further study is needed to determine the significance of this discrepancy.

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Healthy broccoli?

SIR — The interpretation by Culliton[1] of data by Talalay *et al.*[2] is incomplete. In fact, President George Bush's reluctance to eat broccoli may have a sound scientific basis. Despite the benefit derived from the consumption of nutrients containing inducers of enzymes that detoxify carcinogens (phase II enzymes), such as sulphoraphane, the opposite side of the equation, the formation of active carcinogenic metabolites, cannot be overlooked.

Without commenting on the wisdom of the president's lack of taste for broccoli, we would like to point out the conceptual error that phase II enzymes are detoxifying only and that the monofunctional inducers sulphoraphane, cinnamates, coumarins, thiocarbamates, diphenols and so on increase the expression of such enzymes and can thus protect against carcinogens.

It is well established that several phase II enzymes, such as epoxide hydrolase, UDP-glucuronyl transferase and glutathione *S*-transferase, are responsible for the bioactivation of many carcinogens[3]. Therefore, each phase II enzyme system may be considered as an activating system towards specific chemical classes, for example aromatic polycyclic hydrocarbons in the case of epoxide hydrolase or halogenated hydrocarbons in the case of glutathione *S*-transferase[4].

There is no doubt that a magnification of phase II enzyme activities may have, simultaneously, a dual effect. If on the one hand it is possible to have an increase in detoxification and excretion for some chemicals, then on the other the many active precarcinogens point to the importance of this aspect for human health. Each post-oxidative enzyme should thus be considered as 'detoxitoxicant' depending on the chemical involved. Taking into account that humans are exposed to a myriad of compounds, attempts to induce phase II enzymes by dietary components to reduce risk for mutations and cancer should be reconsidered carefully[3].

Finally, the enthusiastic manner in which the media recommend eating broccoli in the name of a long and healthy life should be restrained by the knowledge that dietary broccoli is also able to increase several cytochrome P-450 isoforms[5] (phase I, typical activating enzymes). Indole carbinol, a strong promoter of carcinogenesis[6] and of inducers of dioxin-metabolizing (P450IA2) enzymes[7], is present in large amounts in broccoli and in other members of the *Brassica* family.

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Curved saplings at Mt St Helens

SIR — Bursik and Woods[1] noted downslope curvature among standing Douglas fir and Sitka spruce saplings in forests blown down by the lateral blast of Mount St Helens on 18 May 1980. They proposed that the curvature was caused by greater shrinkage of compression wood (downslope) than normal wood (upslope) during the eruption. They concluded that sapling curvature can be used to reconstruct the temperature and duration of a lateral blast.

I question these interpretations for two reasons. First, Bursik and Woods did not exclude other explanations, such as snow creep, for the downslope sapling curvature. Spring snowpacks at Spirit Lake commonly achieve depths of 2 m (ref. 2) and could certainly creep and bend saplings downslope. Second, if saplings northeast of the volcano are truly acting as "bimetallic strips", an unusual amount of shrinkage-prone[1] compression wood in local tree stems, rather than the heat of the 1980 blast, may explain downslope curvature after death.

FIG. 1 Living upslope-curved Pacific silver fir saplings in forest northeast of Mount St Helens 2 km from 1980 blast zone (1989 photo; 46°20.85′ N, 122°01.25′ W, 1,160 m). Note downslope-curved trees in background potentially caused by snow creep. Shovel handle is 0.5 m long.

My evidence for the latter inference consists of two photographs (Figs 1, 2) showing that curvature is a natural feature of trees in forests northeast of Mount St Helens. Such stems contain abnormal quantities of compression wood in their lower 2 m (ref. 3).

Although the cause of upslope curvature in tree stems is a matter for debate[4], such curvature in 300–500-year-old local Douglas fir (Fig. 2), and its absence in Douglas fir more than 510 years old at the same sites[5], suggest that soil creep is responsible; the younger trees are rooted on a thick (>1 m), unstable AD 1480 tephra layer[6]. Saplings that started growing before 1980 are probably now similarly responding to creep of the AD 1800 tephra[5] blanketing the landscape northeast of the volcano. Similar upslope curvature occurs among trees on loose volcanic debris at Lassen Volcanic National Park, California[7].

Thus, the downslope-curved saplings noted by Bursik and Woods may be unrelated to the 1980 blast. The curvature could be related to snow creep or to warping of stems containing atypical levels of compression wood. These alternative hypotheses can be tested by studying saplings in forests outside the blast zone.

Finally, the saplings examined by Bur-