direct effects of temperature and by indirect effects of changes in leaf nitrogen content (e.g. Lindroth *et al.* 1997). Changes in leaf quality are due to decreased nitrogen concentrations and increased levels of carbohydrates (e.g. starch) resulting from the increased photosynthesis. There is contradictory evidence from different studies that carbon-based allelochemicals increase due to increased carbon accumulation, as predicted by Bryant *et al.* (1983), but phenolics are more likely to increase than terpenoids (Bezemer and Jones 1998). The increased leaf C:N ratio is predicted to lead to a decline in performance of many herbivores, but the details vary depending on the plant–insect pair. As usual, research has been biased towards leaf-chewing Lepidoptera, mainly agricultural pests, which show generally negative (but not always significant) effects on larval growth as a result of the nitrogen dilution effect and resulting increases in food consumption (Watt *et al.* 1995; Coviella and Trumble 1999). Many orders, including Orthoptera and Coleoptera, have been almost ignored in this research area. One of the anticipated effects of climate change is that the synchronized phenology of plants and herbivores, well known for temperate forest pests which are early-season specialists on immature plant tissue, may be disrupted (Ayres 1993). For a particular plant–herbivore interaction, the temperature sensitivity of development is unlikely to be identical for both parties, and temperature change will favour one or the other. Multiple effects of climate change are a powerful stimulus for research on the physiology of both plants and their herbivores and on the ecological interactions between them, but predictions are difficult when the effects of enhanced atmospheric CO_2 tend to be specific to each insect–plant system. (Coviella and Trumble 1999; Chapter 7).