past temperatures in middle and high latitudes derived from both geological evidence and atmospheric modelling. Nevertheless, the new study by Petit-Maire *et al.*[2], who review the evidence for long-term variations in both wetland and dryland ecosystems in the Sahara and Sahel, provides further support for the tropical hypothesis. The most continuous and representative record of the extent of wetlands is provided by the concentration of freshwater diatoms (siliceous microfossils) in deep-sea sediments from the Equatorial Atlantic[7]. During arid phases, large quantities of diatoms were swept up from desiccated lakes and swamps and blown out to sea by the wind. In wetter periods, when the West African summer-monsoon rains were more intense and penetrated further north into the Sahara, the diatom-rich sediments were protected from erosion by water and vegetation.

The timing of the wet phases is supported by numerous geochronometric dates on outcrops of lake sediment in the Sahara and Sahel (although Petit-Maire *et al.* fail to point out that the interpretation of uranium-series dates on lacustrine materials is controversial). The four largest CH_4 peaks in the Vostok record also coincide with peaks in the discharge of the Nile, as recorded by sapropel (organic) layers in eastern Mediterranean deep-sea sediments.

Expanding wetlands

During periods of high rainfall, such as the early to mid-Holocene (10–5 kyr ago), freshwater habitats expanded dramatically across the region stretching from northern Algeria to Ghana in western Africa, and from southern Egypt to Tanzania in eastern Africa. In Mali alone, the area of swamps and shallow lakes increased by at least 56,000 km^2 (ref. 8). Much of the enlarged wetland area consisted of herbaceous (grass, sedge and reed) swamps[2] with very high rates of CH_4 emission[9]. In central and eastern Africa, a key role was probably played by the tall sedge *Cyperus papyrus*, which grows in dense stands with very high primary productivity, rapid rates of decomposition, and highly reducing muds[10]. The northward spread of grassland, wooded grassland and forest during wet phases would also have greatly increased the biomass of wild herbivores and termites[2].

A further argument[2] for a strong tropical contribution to the Vostok record is the occurrence of a sharp decrease in atmospheric CH_4 (by about 170 p.p.b.v.) during the short cold episode known as the Younger Dryas at the end of the last glaciation. This corresponds to an important dry event in northern and eastern Africa[11], and northern South America[12]. In contrast, there is at present little evidence for a significant cold oscillation within the continental permafrost regions of North America and Eurasia[13].

The arguments of Petit-Maire *et al.*, although persuasive, leave many questions unanswered. Recent estimates suggest that 24 (ref. 14) to 56 (ref. 9) per cent of the present CH_4 flux from wetlands originates between 30° N and 30° S. Natural wetlands still account for about a fifth of global CH_4 emissions[3], although this figure must have been higher in the pre-agricultural era. Thus, it seems unlikely that orbitally driven changes in tropical precipitation alone can account for the scale of variations observed at Vostok, unless rates of emission from tropical sources are even higher than currently believed. More data on CH_4 fluxes from tropical ecosystems, especially dense papyrus stands, are urgently required. However, the palaeoclimatic record suggests that climate modellers must improve their predictions of tropical precipitation if the feedback effect of greenhouse warming on CH_4 emissions is to be reliably assessed.

A further difficulty arises because past insolation variations in the Northern and Southern Hemispheres were almost in antiphase (see figure). Although Petit-Maire *et al.* claim that the climatic evolution of the Sahara and Sahel was typical of the tropics at large, the interiors of southern Africa, Madagascar, and southern tropical and subtropical South America appear to have been relatively dry during the early and mid-Holocene[15,16]. But it seems that these regions were much smaller and experienced weaker climatic changes than the vast areas influenced directly, or indirectly via the atmospheric circulation, by variations in Northern-Hemisphere insolation[15]. □

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DAEDALUS

Second sight

In three-dimensional television, two cameras view the same scene. Each relays its image to one eye of the viewer, who fuses the images into a subjective picture with stereoscopic depth. Daedalus has devised a stereo-TV helmet to do this in real time. Each of the eyepieces is fed from its own forward-pointing single-chip TV camera; the wearer sees the world around him as a binocular TV image. The cunning part is this: an electronic frame-store slightly delays the image received by one eye. Daedalus wants to find out how much delay is needed to prevent the stereoscopic fusion of a moving scene, and whether viewers can learn to tolerate and interpret scenes with a significant time-lag between left and right images.

The applications are obvious. Our senses judge rates of change very poorly. Many motor accidents, for example, are caused by bad guesses of the closing rate of another vehicle. But a driver wearing Daedalus's TV time-lag helmet will experience rates of change directly, as a difference in size or position between left and right images of an object. He will have wonderfully acute reactions, and should make a superlative driver, test-pilot or astronaut.

More cunning still, Daedalus points out that the left-hand part of the visual field goes directly to the right lobe of the brain, which is intuitive and nonverbal. The right-hand part of the scene goes to the left lobe, which handles speech and reasoning. So Daedalus is modifying his TV time-lag helmet to delay the right-hand half of the picture presented to each eye with respect to the left-hand half (or vice versa).

The psychological impact should be profound. Although the left and right brain lobes generally pool their knowledge, even a slight time-difference between them would give a powerful advantage to the lobe that gets the information first. A normally logical wearer could develop his intuitive side, while a wearer dominated by immediate emotional reactions could delay them, and see things more coolly and rationally. One side effect might be a strong sense of *déjà vu*, that weird feeling of having been in exactly this situation before. This is claimed to arise when the two brain lobes get out of synchronism, so that one is seeing what the other has already stored as memory. Some psychiatric patients feel this way almost all the time. A suitable reverse setting of Daedalus's delay helmet should be able to cancel the effect, and restore the sufferer to real-time existence. *Déjà vu* would at last be definitively explained, and the inter-lobal time-lag that causes it could be measured. David Jones