Bible. Moses and Jesus never said a word about it. The Mahabharata and the Tao Te Ching have nothing on it. Surely this largely irrelevant fragment of doctrine cannot in any way be taken as representative of religion. Likewise, are not all of the miracles of contemporary engineering from Power Macs and Windows to Mars Rovers, and all of solid-state physics, chemistry, materials, and geo- and agricultural science, much more accurately representative of "science" as the public knows it?

It is said that when Max Planck died and went to heaven, St. Peter offered him the choice of two salons: "The Kingdom of Heaven" and "Discussions about the Kingdom of Heaven." The science-religion interface is *not* a discussion, as Easterbrook's article would imply. Most religions demand lives committed to certain actions and behavior patterns (orthopraxis) linked only by tenuous ways to believing certain dogmas (orthodoxy). Among the latter, creation ranks pretty far down for 90% of believers. Theology, not religion, is literally God "talk." And very little of it is about creation. That most famous English bishop John Robinson argued, 25 years ago, that our *word* God must go. Religions like Buddhism have done very well without much God *talk*. It is not "dogma" but "praxis" that is the heart of religions. The real "science and religion dialogue" should be about what each has to say about how each helps one "to do justice, love kindness, and walk humbly" in our world. Now that's an Old Testament definition of religion.

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The Carbon Crop: Continued

With regard to the relentlessly positive article by Anne Simon Moffat about forests as carbon sinks (Research News, 18 July, p. 315), it is worth noting several points, the most critical being the importance of differentiating between harvesting a forest stand for biomass energy and doing so for wood products. In the case of biomass energy, wood is a direct substitute for fossil fuel, and to the degree that the silvicultural practices are sustainable over multiple rotations, the recycling of carbon through biomass energy is preferable to one-way emissions through fossil fuel combustion. Harvesting for wood products, however, is certainly not a "one-time, permanent movement of carbon from the air to the land surface." Particularly in the case of converting native forests to plantations (*1*), but even in the case of intensely managed forests, significant losses of carbon are associated with harvesting. At the time of a clear-cut harvest, the noncommercial part of the trees (that is, branches and roots) are burned as slash or left to decompose; other ecosystem components such as the litter layer and understory are likewise oxidized in one way or another, and a large fraction of the merchantable wood may go into products with lifetimes of less than 5 years. In a case study in the Pacific Northwest, only 23% of merchantable wood harvested in this century was currently in long-term storage in landfills or wood structures (*2*).

With regard to the benefits of afforestation as an emissions mitigation strategy, the article would have been more informative had it told more about the relative magnitudes involved. In the case of afforesting 1000 hectares of land to offset "some" of the carbon dioxide emissions from a proposed fossil fuel burning power plant in Oregon, this proportion over the lifetime of the power plant amounts to about 1% of the plant's total carbon emissions. Afforestation on a scale to affect the global carbon cycle would

require many millions of hectares and massive long-term commitments (3).

In relation to declining rates of deforestation, the uncertainty about rates of deforestation is such that it is difficult to specify recent trends. Globally, the rate of deforestation in the 1990s is about the same as it was in the 1980s (4). Intact forests are large reservoirs of, and in many cases sinks for, carbon. Thus, reducing deforestation and maintaining the functional integrity of extant forests are probably the biggest near- to mid-term contributions that forestry management could make toward improving the carbon balance of the terrestrial biosphere.

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I want to commend Moffat for her article on carbon sequestration through forest regeneration and Daniel H. Janzen on his timely letter (15 Aug., p. 883) regarding the need to internalize environmental costs and create socioeconomic forces that will motivate people to sequester carbon through reforestration. However, the reforestration sequestration strategies seem to be attempts to capture the horse, so to speak, after it has left the barn.

I want to put in a plug for a carbon mitigation strategy that seems to get overlooked when environmental scientists and policy-makers get together to develop carbon mitigation strategies—the substitution of hydrogen for carbon as the preferred global chemical energy carrier: in other words, creating a hydrogen economy.

Hydrogen is now a clean, safe, and efficient energy carrier (*1*). The technology and equipment needed to convert primary energy sources (whether biomass, fossil, nuclear, geothermal, hydro, or solar) to hydrogen fuels are available from a wide variety of manufacturers. The only significant barriers to widespread market penetration of hydrogen energy systems are economic: cost and custom. As Janzen notes, the energy consumer does not usually pay for pollution, and thus has no incentive to think about cleaner energy, let alone actually use more efficient technologies, such as hydrogen fuel cells.

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I would like to call attention to another possible carbon sink: the calcareous algae (Corallinaceae) that cover large extensions of sea platform in many regions of the world and so far have been overlooked by many geochemists. Over 90% of the thallus of the calcareous red crusts is composed of carbonates, accumulated by these algae to deter herbivores (*1*). Along the Brazilian coast, for instance, the stocks are estimated to be around 2×10^{11} metric tons (*2*), which corresponds to about 45 gigatons of carbon dioxide. The residence of this carbon is certainly much longer than that of carbon fixed in forests, because it is not metabolized and remains buried under successive layers of calcareous crusts. There are commercial companies interested in the exploitation of the Brazilian beds of calcareous algae, mainly to be used to balance acidic soils, but this use would decrease the retention time of the carbon in this sink.

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Assigning Credit

In an editorial about scientific ethics (18 Apr., p. 335), one of us (C.K.G.) argues the need to assign proper credit for authorship. The celebrated Luria-Delbrück paper (*1*) on