ESTIMATED Hg EMISSIONS FROM FOREST BURNING IN THE AMAZON

Biomass	t ha ⁻¹	Hg (µg g ⁻¹)	Hg release efficiency (%)	Hg release (g per ha)
Above ground wood and litter (roots, fallen trunks and standing trunks)	216	0.02	90	3.8
Above ground leaves and below ground roots	54	0.03	75	1.2
Soil organic matter	47	0.30	20	2.8
Total	317			7.8

cient help of mycorrhizae. Plant litter in the Amazon shows lower concentrations than the living leaves¹⁰. Therefore I will use the same concentrations used for trunks for this compartment. The soil organic matter Hg content used by Veiga *et al.* is in agreement with reported values for the Amazon, and their value for efficiency of Hg release during burning seems fair.

Recalculating the estimates of Hg release to the Amazon atmosphere through forest burning (see table) and using the deforestation rates of 1990–1991 of 11,100 km², I obtain approximately 8.7 t for this year. Even taking the largest estimates of 1978–1988, roughly 17 t of Hg would have been emitted annually during that period, still four to five times lower than the proposed estimate of Veiga *et al.* Even this value is likely to be an overestimate, as Hg concentrations in biomass from the Amazon forest as well as in soil organic matter will probably be much lower. In addition, many deforested areas are now in various stages of regrowth following abandonment, therefore actually accumulating Hg in their fast-growing bio-

mass. Thus tentative estimates of total Hg released from deforestation during the past 20 years are useless. Finally, a significant proportion of the biomass remains intact after burning, keeping a fraction of the Hg preserved as partially burnt vegetation and as coal.

Using the year 1990 for comparison, Hg emission to the atmosphere in the Brazilian Amazon due to gold mining ranged from 70 to 100 t (refs 2, 3). Recently, this type of mining spread throughout other Amazonian countries. In Venezuela, 40 to 50 t of Hg are released by this activity³. In Colombia, Peru, Ecuador and Guyana, at least 10–20 t more are released annually², and more mining fields are being opened every year. Therefore, although deforestation is a serious environmental threat to the Amazon, if there is any “significant villain” in the emission of Hg to the Amazon, it is definitely gold mining.

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Origin of chondrules explained

SIR — Chondrules generally are millimetre-sized, near-spherical stony objects that are the main constituent of the most primitive types of meteorite. Many regard chondrules as having formed in a protoplanetary disk by complete or partial melting of nebular solids. In contrast, I believe that chondrules probably resulted from interactions between already differentiated, partly molten planetary bodies.

My view was, unfortunately, misrepresented in the News and Views by Ash¹ by his statement that I “... prefer an origin in a modified, geologically undifferentiated planetary body. . .”. Since the early 1970s, when plagioclase glass with a planetary chemical signature was discovered in an ordinary chondrite², I have tried to demonstrate that some chondrules at least

were the product of differentiated planetary bodies³. Furthermore, Ash perpetuates a common misconception that chondrules have “approximately solar” “relative abundances of refractory trace elements”. At the conference on which his article was based, after exchanges between several participants, it was agreed that chondrites (the bulk meteorites) have approximately solar elemental abundances but that there is “large compositional variability of chondrules from a single meteorite, reflected in major variations of Mg/Si ratios, of Al and other refractory element abundances. . .”⁴.

The ‘magic’ to be explained is how chemically diverse objects, chondrules, be they nebular or planetary, when mixed in nature in gram-sized or larger amounts, always produce uniform, near solar compositions.

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The world's oldest songbird

SIR — The songbirds or passerines (Passeriformes) are the most speciose and widely distributed order of living birds, comprising about 60% of the 9,000–10,000 Recent species and occurring on all continents except Antarctica. It is not known whether the Passeriformes had a northern or southern origin. Traditional, pre-continental drift views held that Australo-Papuan passerines were derived from and often confamilial with Northern Hemisphere invaders¹, an interpretation challenged by palaeontological evidence and molecular studies². These latter studies concluded that the many endemic Australo-Papuan passerines were part of a large-scale autochthonous radiation from but a few ancestral types, overlaid by more recent northern invaders².

These ideas have yet to be verified by unequivocally identified fossils; all purported Eocene and Oligocene passerines before 1989 were misidentified³. The earliest undoubted passerines come from Late Oligocene deposits in France⁴. The extensive early Tertiary sites in North America and Europe contain many small arboreal forms, most belonging to the Coraciiformes; none is passerine³. It has been proposed that passerines had a southern origin, not spreading to the Northern Hemisphere until the mid-Tertiary⁵. Unfortunately, there is no evidence of early Tertiary passerines in Southern Hemisphere deposits^{6,7}. An Early Eocene site from Murgon, southeastern Queensland, has now yielded material identifiable as passerine.

The matrix yielding the fossils is green clay, radiometrically dated potassium/argon; illite) at $54.6 \pm 0.05 \times 10^6$ years⁸. This age is corroborated by non-avian elements of the Tingamarra local fauna, which includes Australia's oldest frog, trionychid turtle, madtsoiid snake, marsupials, bat, and non-volant placental mammal. The fossils of passerine and other birds form the earliest modern, non-marine avian assemblage from Australia⁹.

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