# Letters

## That Polluting Automobile

Jamison's article (5 July, p. 27) describes the growing controversy over the steam automobile very clearly and delineates the political and technical difficulties of controlling automobile pollution. The automotive transportation industry is so enormous and its effects on the national economy and the daily life of the individual automobile owner are so immediate that a change to steam engine power could have drastic repercussions if it were accompanied by a major degradation of performance or increase in price or maintenance costs. The basic dilemma confronting the public is that this pervasive yet unregulated industrial giant is unwilling (and probably unable) to advance technologically at the pace required to control and diminish its harmful by-products of air pollution, yet no other agency could possibly effect the required change in nearly 100 million vehicles of the coming "generation" (whose life span is a mere 10 years).

As a machine, the automobile is scientifically a crude device, operating on fundamental thermodynamic principles which were well understood even a century ago. Almost all the technologically sophisticated developments made by the industry have been concerned with reducing manufacturing costs while at the same time increasing the reliability and decreasing the expense of operation. Yet it is no exaggeration to say that the scientific causes of air pollution produced by automotive engines are not understood, at least in the quantitative sense necessary for controlling pollution. No one can say how much the pollution level of present engines can be reduced even though all the cut-and-try efforts to date have not yielded much improvement. Given the past irrelevance of this level of scientific understanding to the automotive business, this lack of knowledge is not surprising. In neither the programs of the responsible federal agencies nor those of the automotive manufacturers have we been able to detect any substantial recognition of the need for fundamental scientific research on the causes of air pollution as distinct from a search for a cure. We believe that there is a low probability of quickly finding a cure when a fundamental understanding is lacking.

The lack of careful scientific work on automotive pollution is no exaggeration. For example, to our knowledge the low levels of air pollutants for the steam engine quoted in Jamison's article have not been published in the technical literature. A private report, published by the Steam Automobile Club of America, Inc., quotes a hydrocarbon emission level for the Williams steam car of "20 ppm = 2 grams per mile." The latter figure of 2 grams of hydrocarbon per mile of automobile travel is only slightly less than the 1970 national standards of 2.5 to 4.1 grams per mile, depending upon engine size. We believe these quoted figures are inconsistent, and that publication in the scientific literature of the results of measurements are necessary before definitive statements on the antipollution potential of the Williams car can be made.

While there are sound scientific reasons for expecting that steam engines will produce lower levels of pollutants than present internal combustion engines, we cannot exclude the possibility that emission levels from the latter could be significantly reduced. It must be remembered that internal combustion engines were developed primarily as cheap and efficient power plants, and little if any consideration was given to the composition of the exhaust products until recently.

Several methods for reducing pollution from internal combustion engines are already being investigated, and many more undoubtedly exist. All of these will probably involve some compromise with the performance of present engines; however, similar compromises will undoubtedly have to be made in developing the steam engine as an acceptable substitute for the internal combustion engine. Ultimately the decision as to when the best compromise has been reached can only be made when we have achieved a quantitative understanding of both internal and external combustion processes involving hydrocarbon fuels. At the present time this is lacking, and a vigorous research program supported by both government and industry is clearly needed.

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## Amazonian Fauna: Protectors and Exploiters

I hate to place myself (again) in the position of defending the exploiters of the flora and fauna of the Amazon Basin, since I am actually an ardent conservationist. Nevertheless, as is generally the case, there is another side to the "exploitation" described in Quaintance's letter (9 Aug.). It is true that some mammal and reptile species have become scarce around Leticia, Colombia, in part under the pressure of native collectors for the U.S. market. (Aquarium fishes have been much less affected. When marketable fishes become scarce in one stream, the Indians move on to another stream. The depleted stream eventually rebuilds to its normal capacity.)

But what about the other side of the coin? Thousands of isolated people along the Amazon have as their only means of earning money the collecting of animals. If animal collecting were to be made illegal, these people could no longer buy clothes for their children or gasoline for their outboards. Dare we say, "Save the animals. Let the natives go naked and paddle their canoes"?

Also, Quaintance implies that "the honorary U.S. Consul at Leticia" (named Mike Tschalikas) is an agent of American imperialism. Anyone who has traveled in that part of the world knows that Tschalikas is respected and loved up and down the Amazon for his humanitarian activities. Many natives and more than a few Americans owe their very lives to him, and hundreds of natives depend upon him for their livelihood. His animal compounds