the two sites to be filled by Na. Given the "limiting non-zero ouabain-sensitive K influx" described by Cavieres and Ellory in these conditions[2], the minimum requirement of a model for the pump is that two sites can be occupied by Na and one by K simultaneously. Two possibilities are that (1) the external pump form $^{Na}X_K{}^{Na}$ is capable of active K translocation, or (2) additional K or Na sites (for example, the form $^{Na}{}_KX_K{}^{Na}$) are present on the external aspect of the pump.

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A. S. HOBBS*
P. B. DUNHAM

Department of Biology, Syracuse University, Syracuse, New York 13210

*Present address: Laboratory of Neurochemistry, National Institute of Neurological Diseases and Stroke, National Institutes of Health, Bethesda, Maryland 20014.

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CAVIERES AND ELLORY REPLY—The finding of an upwards deflection of the $1/v$ against $[Na]_0$ curve would certainly be very interesting. Unfortunately the deviation from a straight line in the data presented[1] is effectively based on only one point ($[Na]_0 = 140$ mM), where the flux is 13.6% lower than it would be for a straight line fit. From the legend to Fig. 1 it is apparent that cell K ($\sim$ 8 mM) can be $\sim$ 10% lower in the cells incubated in 140 mM Na medium, thus reducing the K influx by $\sim$ 5% (ref. 6). If the further contributions of experimental error (up to 3.9%) and the scatter (for example, for $[Na]_0 = 10$ mM) are considered, it becomes difficult to defend the departure from the straight line fitted through the remaining data. In fact, from inspection of our earlier experiments carried out at a $[K]_0$ of 1 mM, we could find no evidence for deviation from a linear relationship. A final possibility (although unlikely), is that the difference in internal K between our experiments (K $\sim$ 50 mM) and theirs (K $\sim$ 8 mM) may have a role.

University of Cambridge

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Haze in the stratosphere from the Fuego eruption

SCORER[1] reported seeing an extended haze layer during Concorde flights at heights up to 17 km (56,000 feet) on September 1, 1975 from London to Gander and back. He assumed that this was the result of large scale ascent of normal tropospheric dust. On the premise that this was indicative of the normal interchange mechanisms across the tropopause, he then concluded that the theories which have led to the recent 'ozone depletion scares' are based on 'nonsense' suppositions regarding the nature of the vertical transport in the stratosphere.

A much more likely explanation of the haze layer observed by Scorer is that this was aerosol remaining from the material injected into the lower stratosphere by the violent eruptions in mid-October 1974 of Volcan de Fuego in Guatemala. A number of different investigators reported the appearance of a haze layer (or layers) between $\sim$16 and 20 km during the following months[2]. Further observations during the past year, with lidar[3], twilight measurements[4], dust sonde[5], and searchlight measurements[6] indicate the continued presence of this dust layer over Hawaii, Puerto Rico, and northern mid-latitudes. It is probably still present over the Arctic, but it is not known whether any dust reached the Southern Hemisphere. According to the lidar data the layer has diminished slowly since early spring 1975 with a residence time of $\sim$6 months—about half that of large volcanic events. Measurements at several locations show, however, that purple twilight glows are now (after a minimum in April) nearly as strong as those of winter 1974–75. The haze phenomenon described by Scorer has often been studied in colour photographs obtained by time lapse cameras flown on balloons, mostly over New Mexico[7]. In the flights from December 1974 to the most recent in October 1975, strong haziness near the solar azimuth extends to $\sim$20 km. If the Sun is not high up, a rather sharply bottomed haze band appears at a balloon altitude of $\sim$16 km. When the balloon is in the main layer, the distant horizon disappears, and thin layers may be noticed briefly. When the balloon is leaving the layer the distant haze top becomes sharp and edged by deep blue sky. Optical measurements showed very little aerosol in the region of the layer in question during 1972–74, but some thin layers could always be detected in the balloon photographs because of the great path length.

Zenith attenuation of solar radiation by the Fuego dust was hardly $>1\%$. Therefore the change of Earth temperature was $\sim$0.2 K only[8], and the effect on vertical transport less than that suggested by Scorer.

F. E. VOLZ
E. P. SHETTLE

Air Force Geophysics Laboratory, Hanscom AFB, Bedford, Massachusetts 01731

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SCORER REPLIES—A characteristic of the occasion on which I observed the haze was that there were cirrus clouds above the tropopause and the tropopause itself was not apparent to the eye. After a year I would have expected purple twilight to have been much decreased, as the note says it was in April, and the large vertical extent of the haze suggested that it was not very old, otherwise it would have been sheared over into thin layers, of which several would be unlikely to be found together over one geographical location.

On the assumption that such layers come from volcanic eruptions, anyone determined enough can, of course, ascribe them to the one they think to be the most likely cause; but it is important to recognise that the assumption can dominate thinking about these phenomena. That explanation is not "more likely" except after acceptance of the assumption.

I do not see what attenuation of solar radiation or change of Earth temperature have to do with the radiative equilibrium, which I supposed was dominated by a change in the absorption of the outgoing long waves.

Reiter[1] gives a spread of residence times for stratospheric air ranging from 80 to 1,000 d at 20 km, which seems reasonable. Therefore to ascribe finality to any explanation of the haze is possible only if it can be traced accurately back to its origin. What I am suggesting is that there are probably many manifestations of the mass-interchange mechanism not yet properly investigated, and that hurricanes could be involved to an important extent.

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Matters arising

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