of each type of water to give continuing definition to the water masses; the structure would be lost by the process of random mixing," and "if only 5 percent of the deep oceanic waters were to release their excess CO_2. . . ." Considering the slow deep circulation, one might assume release of potentially large amounts of CO_2 to involve centuries and not decades; however, how deep waters release CO_2 to the atmosphere is not completely understood.

The oceanic warm water lid (*1*, paragraphs 3 and 4), which is scheduled, according to theorists, to develop with global warming, is a surface phenomenon different from stratification induced from influence of cold polar regions. With warming of the climate, high latitudinal regions will theoretically warm more rapidly than low, reducing wind speeds and thus wind stress on surficial waters (*12*), possibly decreasing upwelling and vertical convection; it may also (*13*) raise the bottom of the lighter oceanic water making it more accessible to mixing, and affect levels from which upwelled waters are drawn. This scenario is controversial.

The paleotemperature data and discussion by Cornell and LeMone (*7*, paragraphs 2 and 5) do not focus on the time of the extinctions. Synthesis of marine isotopic temperatures by Margolis *et al.* (*14*) indicate "the Tertiary/Cretaceous boundary appears actually to fall during a time of significant global warming of bottom and surface waters, which lasted until the Early Eocene." Savin (*15*), on temperature histories of the South Atlantic and North Pacific, noted "isotopic temperatures recorded by both planktic and benthic fossils dropped by a few degrees in early to middle Maastrichtian time, and then recovered. . . ." "The drop occurred prior to the end of the Maastrichtian and hence earlier than the great extinctions of the Cretaceous-Tertiary boundary." However, Savin is careful to cite sampling problems associated with the boundary interval.

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17 October 1979

Psychophysical Functions and Regression Effect

Moyer *et al.* (*1*) commit an error of statistical concept which, while it seems to have no important bearing upon the validity of their conclusions, seems worth pointing out in order to lessen the chance of its recurrence in other, less innocuous settings. Their error is one of overcaution, of fearing an artifactual regression effect in a situation in which none is possible and reacting to this fear by introducing an erroneous correction. Stripped to the statistical essentials, the situation they consider is one of comparing two regression lines fitted by least squares, the "perceptual" line $P_i = a_P + b_P X_i$ and the "memorial" line $M_i = a_M + b_M X_i$, the principal question being the comparison of the slope coefficients b_P and b_M. (Here, to focus upon their second experiment, P_i and M_i are, respectively, apparent perceptual and memorial magnitudes recorded in response to $i = 1,2,\ldots,48$ states with log relative areas X_i, by two independent groups of subjects.)

The investigators note that the squared correlation coefficients $r_{XM}^2 = .934$ and $r_{XP}^2 = .982$ are unequal, and fear a possible regression effect. In their reference 16 they suggest correcting for $r_{XM} \neq r_{XP}$ by comparing the slope b_M with $(s_P/s_X)r_{XM}$ instead of with $b_P = (s_P/s_X)r_{XP}$ (*2*). They give no further explanation for their correction, but I assume it is based upon reasoning such as the following: If the pairs (X_i,M_i) and (X_i,P_i) are considered as two sets of bivariate data, and the appropriate measures of the relationships between the variables were s_M/s_X and s_P/s_X, then it would be misleading to compare $b_M = (s_M/s_X)r_{XM}$ and $b_P = (s_P/s_X)r_{XP}$, if $r_{XM} \neq r_{XP}$. This view might be defensible if, say, the data were bivariate normal and the slopes of the major axes of the elliptical contours were the relationships of interest, but this is not the case here. The situation here is the classical regression situation (*3*) in which the experimenter selects the values of X, and the conditional expectations of M and P given X are the relationships of interest. In the given situation, these are estimated without bias by the least-squares lines $P = a_P + b_P X$ and $M = a_M + b_M X$, and no correction for a regression effect is needed.

In fact, a correction of the type attempted will introduce a bias. They suggest comparing b_M with $(s_P/s_X)r_{XM}$ instead of $b_P = (s_P/s_X)r_{XP}$. That this invalid can be seen by considering the extreme case where $r_{XM} = 0$ and memory serves only to destroy the signal, replacing it with noise. Their correction would suggest that perception and memory were equally unreliable, even if $r_{XP} = 1$! Rather than viewing $r_{XM} \neq r_{XP}$ as a cause for concern, it should be viewed here as reassuring. If the two least-squares regression lines fitted to the same X values fit equally well [as judged by their respective residual sums of squares (*4*)] and have equal correlations, then they must have identical slopes (*5*).

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References and Notes

1. R. S. Moyer, D. R. Bradley, M. H. Sorensen, J. C. Whiting, D. P. Mansfield, *Science* **200**, 330 (1978).
2. The notation here differs slightly from that of (*1*). Here $s_X^2 = (n-1)^{-1}\Sigma(X_i - \overline{X})^2$, $s_M^2 = (n-1)^{-1}\Sigma(M_1 - \overline{M})^2$, $s_P^2 = (n-1)^{-1}\Sigma(P_i - \overline{P})^2$, and r_{XM} and r_{XP} are the sample correlation coefficients of the (X_i,M_i) and (X_i,P_i), respectively.
3. See, for example, K. A. Brownlee [*Statistical Theory and Methodology* (Wiley, New York, 1965), p. 409] for a discussion of the relationship between regression lines and bivariate distributions.
4. Indeed, one of the unstated assumptions underlying the validity of the *t*-test employed in (*1*) comparing b_P and b_M is that the error variances are equal for the two lines, in which case the residual sums of squares would have equal expected values, the sample sizes being equal.
5. The residual sums of squares are just $(n-1)s_P^2(1 - r_{XP}^2)$ and $(n-1)s_M^2(1 - r_{XM}^2)$. If these are equal and $r_{XP} = r_{XM}$, we must have $s_P^2 = s_M^2$. Then $b_P = (s_P/s_X)r_{XP}$ and $b_M = (s_M/s_X)r_{XM}$ are equal, too.

8 May 1978

We thank Stigler for his comment on our reference 16, and wish here simply to echo his statement that his observation has no bearing on the validity of our conclusions.

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7 November 1979