presentations and the work load he imposes on his students; a shortage of one can be compensated by an increase of the other.

Because the ratings were obtained after the students had received their final grades, it might be argued that the statistical associations are an artifact of the students' reactions to their grades, such as a desire to "get even" with instructors who give them poor grades. This "retaliation hypothesis" can be tested in the data in two different ways:

Students who received low grades might have been more likely to return the mail questionnaire and also more likely to give their instructor low ratings. But in fact, the average non-regressed exam grade for the 222 students in Introductory Calculus who returned the rating form was 84.2 and for the 81 who did not was 72.6. This difference is opposite to that predicted by the "retaliation hypothesis" and is highly reliable ($t = 5.16$, d.f. $= 301$, $P < .001$). Similar data were observed in Multidimensional Calculus: an average grade of 73.8 for the 132 students who responded and 63.3 for the 56 nonresponders ($t = 3.93$, d.f. $= 186$, $P < .001$).

Second, if grades are causally related to ratings independent of the teacher's performance, there should be a high positive correlation within each class between a student's final exam grade and his ratings of the instructor. In the present study these correlations have been calculated for the two factors showing the highest interrater agreement, work load and teacher's presentation. They range from $-.33$ to $+.43$ with an average value of $-.02$; five are positive and eight are negative. These outcomes are not consistent with the hypothesis in question; there is no evidence for a strong positive relationship between final exam grades and the ratings when the effect of the different instructors is removed.

A reasonable explanation for the differences between my results and those of Rodin and Rodin can be formulated by considering the differences in our methodologies. The negative relationship they observed may be a unique outcome which was highly dependent on the principal lecturer's teaching style and the way this style affected the performance of his teaching assistants. Second, the Rodins' rating measure required the students to make a global judgment about teaching performance whereas my questions focused on more discrete aspects of

teaching and on observable behaviors. I believe that the very strong relationships in my study resulted from a successful effort to categorize student ratings in terms of specific factors and thus to be able to separate more useful from less useful ratings. Further research with separate factors might make it possible to identify the important aspects of teaching in particular fields.

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Origin of Mitochondria

In relation to the recent comments between Uzzell and Spolsky (*1*) and Raff and Mahler (*2*), I wish to propose (*3*) that the primitive phagocyte in which bacterial ancestors of mitochondria allegedly settled some 1.5 billion years ago was actually an aerobic cell that relied on peroxisomes instead of on a phosphorylating electron transport chain for its respiratory metabolism. This hypothesis was formulated mainly in an effort to retrace the evolutionary history of the peroxisome, a particle which certain facts suggest may have been of much greater metabolic importance in early eukaryotes than it is in many plant and animal cells today. Acquisition of the more efficient mitochondria was put forward as an explanation of the evolutionary decline of the peroxisome. By the same token, possession of a primitive respiratory system would have made acquisition of mitochondria advantageous even in an aerobic cell. Thus the objection that "the aerobic nature of the ancestral protoeukaryotic cell would make the acquisition of an aerobic symbiont unnecessary" (*2*) loses much of its pertinence.

According to my hypothesis, both the endosymbiont and its host are pictured as originating from primitive aerobic bacteria endowed with a peroxisomal type of respiration ($O_2 \rightarrow H_2O_2 \rightarrow 2\ H_2O$), one evolutionary line leading to the development of a respiratory chain and of coupled phosphorylating systems, the other to the acquisition of phagocytosis and intracellular digestion, proliferation of intracellular membranes, and an increase in cell size. It will be noted that these two evolutionary lines correspond to two distinct, and possibly mutually incompatible, differentiations of the cell membrane.

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Internal Gravity Wave–Mean Wind Interaction

Bekofske and Liu (*1*) have demonstrated that the interaction of a vertically propagating internal gravity wave (IGW) with the background wind shear near a critical level (where the mean wind speed equals the phase speed of the IGW) can increase the background wind shear sufficiently to satisfy the criterion for Kelvin-Helmholtz instability. Breaking of the resulting Kelvin-Helmholtz waves would then

be expected to produce clear air turbulence (CAT). This mechanism is indeed a plausible source for some CAT. However, the idea is not a new one (*2*).

Numerical calculations quite similar to those in (*1*) have previously been reported by Lindzen and Holton (*3*) in their study of the quasi-biennial oscillation in the mean zonal wind in the equatorial stratosphere. Lindzen