way to Cambridge. Clearly, studying Greek and Latin did not qualify him to do this, but rather the trained ability and, in particular, the willingness to address societally relevant problems—a characteristic that is conspicuously missing in many of the scientifically trained graduates coming from today's research universities.

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The Classical–Quantum Border: Laser Sharp?

The article by Eric J. Heller and Steven Tomsovic (July 1993, page 38) is an excellent summary of convincing results that illustrate the agreement between semiclassical approximations and quantum mechanics. However, in case this article creates the impression that there may now be a blurring of the boundaries between classical and quantum physics, it is worth noting that this is contrary to the experience of physics. The correspondence principle for the transition from classical to quantum physics still holds, as has been recently demonstrated—although perhaps not sufficiently emphasized through discussion—by experiments with high-intensity lasers.

For the interaction of electromagnetic radiation with electrons, a correspondence principle is obtained simply from the value of the radiation intensity that would cause a quiver motion of a free electron in the radiation field such that the product of the averaged elongation of the electron and the averaged momentum is h. This separation intensity is 0.5×10^4 W/cm^2 for neodymium glass lasers,[1] a value that has been confirmed by experiment, as discussed below.

For laser intensities of less than this value (or multiples in the case of multiphoton processes), the emission of electrons is described completely by quantum processes, as can be seen from the observed multiple maxima of the electron emission spectra.[2] For much larger intensities, classical behavior without the maxima is obtained. This classical behavior was first measured[3] in 1979, but those results did not achieve a wide degree of acceptance at the time, because they were perceived to conflict with the multiple maxima observed in the quantum range. However, the existence of a classical regime of behavior, without maxima, recently has been convincingly confirmed[4] in experiments where the laser intensity far exceeds the value that separates the branches of the correspondence principle,[1] and the existence of this regime is now well accepted.[5]

I present this argument only so that an otherwise most impressive article on postmodern quantum mechanics does not appear to violate the rather different two worlds of classical and quantum physics.

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HELLER REPLIES: The thrust of Bruce W. Boreham's interesting comment is to suggest that semiclassical methods may not apply in "real" laboratory situations unless some extreme classical limit is approached. We would not want to claim that every phenomenon is easily or correctly given by semiclassical means, but it would seem that Boreham's point misses an important lesson of research in this field: Highly quantum behavior (including oscillations of the type Boreham describes) can often be understood as superpositions of (perhaps many) *amplitudes* calculated from purely classical trajectories. Fully classical behavior is reached only in certain limits and is not the target of semiclassical calculations.

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5/94

Gomory's 'Goals' Too Narrowly National

How can the US set priorities for the funding of basic and applied science? In "Goals for the Federal Role in Science and Technology" (May 1993, page 42) Ralph E. Gomory argues that the first step is to define the goals. I agree with Gomory that setting goals is a powerful basis for decision making; I do not agree with his choice of goals for basic and applied research.

Gomory advocates the following national goal for our basic research