of students from both classes could be interviewed to further ascertain their level of understanding. If students using the consistent histories approach significantly outperform those learning the standard Copenhagen interpretation, it may be worthwhile to develop interactive tutorials similar to those discussed in the article but using the consistent histories approach.

In response to Travis Norsen, we note that we agree with Alan Van Heuvelen, whom Norsen cites, and our approach is consistent with his advice.[3] However, intuition and foundational issues are not exactly the same things. Although a deep understanding of foundational issues may improve intuition, we can help our students develop qualitative, conceptual understanding of many aspects of quantum theory without first having to clarify every foundational issue. Our research suggests that the nature of physical intuition is not well understood, though intuition is important.[4]

As Philip Shemella has suggested, we have used other wordings for the question of interest, including the wording he recommends. Our findings are unchanged. During interviews, the interviewer has often rephrased the question when a student was unable to answer correctly. The responses were qualitatively unchanged.

As Griffiths, Norsen, and Walter Harrison imply, the use of simulations and results from physics education research to address functional issues is just a single prong in what should be a multi-pronged approach to the teaching of quantum mechanics. We agree that addressing foundational issues is just as important.

In addition to the approach taken in textbooks by Griffiths and Harrison, Richard Robinett's quantum text[5] relates pedagogical quantum models to modern experimental realizations of these systems and emphasizes connections to classical mechanics.

We agree with Norman Chonacky that a discussion of the broader role of computation in the physics curriculum is needed. We encourage interested readers to attend the American Association of Physics Teachers topical conference Computational Physics for Upper Level Courses, to be held in July 2007 (see http://www.opensourcephysics.org/CPC/index.html). Its purpose is to identify problems in which computation helps students understand key physics concepts.

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Uncertainty over weakening circulation

Barbara Goss Levi's Search and Discovery story (PHYSICS TODAY, April 2006, page 26) discusses evidence of weakening ocean circulation and its possible connection to global warming. The Atlantic Ocean circulation across 25° N latitude has been used as a benchmark for characterizing the mass and heat transport from the tropics to the northern latitudes. The upper portion of this transport includes the Gulf Stream, which is at least partially responsible for a moderate climate in Europe. A weakening of the Atlantic meridional overturning circulation and of the Gulf Stream might have the unpleasant consequence of cooling Europe's climate.

The PHYSICS TODAY piece is based on analysis of work by Harry Bryden, Hannah Longworth, and Stuart Cunningham,[1] which concluded that the Atlantic meridional overturning circulation slowed by about 30% between 1957 and 2004. Their work inspired speculations that the anthropogenic increase in carbon dioxide may be responsible for the weakening of heat transport from the tropics, and that such an effect has now been detected.

The conclusion that the Atlantic meridional overturning circulation has decreased by 30% does not follow from the data presented by Bryden and coauthors, but is based on an incorrect treatment of measurement errors.

According to Bryden and coauthors, the 1957 transport in a layer shallower than 1000 m was 22.9 ± 6 Sverdrups (1 Sv = 10^6 m^3/s) compared with the transport of 14.8 ± 6 Sv in 2004. The ± 6 Sv represents an uncorrelated error of each measurement. Bryden subtracts the two quantities and presents the results as 8.1 ± 6 Sv (instead of 8.1 ± 12 Sv or ± 8.5 Sv, depending on the character of errors), which is an incorrect result. It is a mystery how such an error was missed by Levi and by the editors and reviewers of the original paper. The observed change of 8.1 Sv is well within the uncertainty of the measurement. The correct conclusion from the data presented in Bryden's paper should have been that no statistically significant change in Atlantic meridional overturning circulation at 25° N between 1957 and 2004 has been detected. Such a conclusion is in agreement with the earlier analysis of essentially the same data (between 1957 and 1999) by Alexandre Ganachaud and Carl Wunsch.[2]

Research also failed to detect any slowing,[3,4] and one of the relevant papers[4] concludes that "there is no sign of any Meridional Overturning Circulation slowdown trend over the past decade, contrary to some recent suggestions."[1]

In defense of Bryden and his coauthors, I must share a comment from a personal communication I had with Bryden shortly after his *Nature* paper was published. Bryden's paper as submitted for publication to *Nature* included a question mark at the end of the title, suggesting only a possibility that the circulation might be slowing down. On the editor's insistence, the question mark was removed, and the title was changed into a positive statement that caused a considerable stir.

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Postscript on Chandra and Eddington

The letters from Arthur Miller and Kameshwar Wali (PHYSICS TODAY,