ULTIMATELY, EXPERIMENTAL METAPHYSICS WILL TRIUMPH:

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For many years, the Einstein, Podolsky and Rosen (EPR) question was considered a matter for debate, not experimentation. Then David Bohm introduced spin in place of position/momentum, John Bell discovered his theorem, and experimental refutation of the EPR position soon followed. Abner Shimony named this development "experimental metaphysics. We predict that ultimately, most or all of the many remaining disputed questions on the foundations of quantum mechanics will be similarly resolved. In particular, such issues as the role of consciousness in collapse, the extent that collapse or decoherence is due to interaction with the environment, the maximum size and weight of Schrodinger cats, the delineation of the quantum-classical boundary, and even the problem of measurement will all be reduced to experimentally decidable questions and then decided. Ultimately is a long time, and some of these questions will be decided sooner than others, but I expect significant progress on many of these questions in less than fifty years. Why do I expect this rapid progress?
Four reasons:

First,
PHYSICS IS AN EXPERIMENTAL SCIENCE

Our contention that these much disputed issues will finally be resolved (certainly ultimately, and probably reasonably soon, perhaps in one lifetime ((for a very young person)) primarily by experimental means, rests on two arguments.
First of course is the deep philosophical prejudice that physics is fundamentally an experimental science. Only experimentally resolvable questions are a proper part of physics, and this applies to the foundations of quantum mechanics as much as to any other area of physics. Exact mathematics is a necessary and useful tool, but experiment is the final arbiter. So sooner or later, these questions must be settled experimentally, or excluded as meaningless. I expect that the route of experimental resolution will prevail for most of the questions listed above.

Second,
THE LIMITS OF COMPUTERS STRETCH THE LIMITS OF PHYSICS

Seth Lloyd has published an article on the ultimate laptop, giving a very generous upper limit on future physics and future computing. Version 2 of his paper has some less extreme limits than version 3. Some of the limits in version 2 of the paper are closer to being tested than those in the third version. In both versions, the paper clearly explains how the limits of physical computation, both quantum and classical, are closely related to more general limits of physics. In particular, the attempt to build one-way or measurement-based quantum computers encroaches on many of these previously metaphysical issues.

Third,
ECONOMIC AND PHYSICAL IMPLICATIONS

Moore's law has significant economic implications. Future quantum computers might also be economically significant, if it is possible to build them reliably at industrial scales. The level of technological capability, economic incentives and scientific curiosity have all reached such high intensity levels that much progress is being made currently and is very likely to be substantially extended in the near future. Efforts to extend Moore's law will soon reach the single atom limit. Some very strong tests will soon be possible. Even stronger experimental tests that are impossible today will ultimately be within reach.

Therefore I actually expect this resolution on an experimental basis to occur quite soon in many of the above cases.

Finally,
COMPUTERS HELP THEMSELVES

Progress in computer science will help resolve these issues. In particular, the use of axiomatic techniques supported by strong computer theorem provers and verifiers will help resolve definitional and axiomatic issues necessary for both reducing the questions to experimentally decidable form and for making clear exactly which assumptions are being tested. This will also help in improving the clarity of communications concerning these experiments. I will make no predictions concerning artificial intelligence, but ultimately much higher standards of rigor in definition and argument will prevail. I predict that the time will come when future journals or their equivalents will either refuse to accept theory papers that have not been mathematically verified, or will routinely use a mathematical theorem verifier as part of the "peer review" process.

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