REMARKS TO HEPAP, JANUARY 28, 2002

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Mr. Chairman, Members of HEPAP, Ladies and Gentlemen:

I am very sorry that I cannot be with you today, but I would like to convey some observations as you begin to consider the report of the long range planning subpanel.

First I thank Jonathan Bagger and Barry Barish for their splendid teamwork in co-chairing the subpanel: we could not ask for better leadership than they have given to this task. Second, I thank each and every member of the subpanel for the hard work, care, and attention they gave to the complex issues laid before them. The subpanel has sought and received substantial input from the community. The advice of the research community through HEPAP is vitally important input to DOE and NSF in their management of the high energy physics program, and has been, since it first met on January 29, 1967. These thirty-five years have seen major advances by the United States in this field of physics, revealing a deeper layer of matter, identifying five of the twelve fundamental constituents of matter, and establishing a powerful theory of the constituents and their interactions. As indicated by the success of the program, HEPAP has been one of the most effective committees advising the federal government. The Department of Energy recognizes the vital importance of this committee and, with your help and advice, is determined to enhance the strength of its high energy physics program in the twenty-first century.

As we stand on the threshold of this new century, I am confident that it will be as successful as the previous one in penetrating the fundamental physics of the universe. The great achievement of the first half of the twentieth century was the complete elucidation of the physical laws underlying the periodic table of the elements. The second half produced the "periodic table" of the fundamental constituents of matter, and gave us deep insight into the forces operating on them. It is my belief that the first half of the twenty-first century will provide us with a much deeper insight, and will, in fact, yield a complete elucidation of the physical laws governing the universe on the smallest of scales and on the largest.

Today we are already embarked on programs that will begin to answer fundamental questions about the Standard Model. At the B-factories, we are learning more about CP violation and by the end of this decade we will find out whether the Standard Model contains all there is to know about this phenomenon, which holds a key to our matter-dominated universe. In the same time frame, experiments at the Tevatron and the LHC will either discover the Higgs or draw back the veil covering the mystery of electroweak symmetry breaking. They should also give us our first glimpse of particles manifesting symmetries beyond the Standard Model—particles that may make up the bulk of "dark matter"—and symmetries that combine gravity with the other forces. Neutrino oscillation experiments should begin to clarify the patterns of neutrino masses and

mixing, and thereby provide us with clues to the proper model for the unification of all forces. From double beta decay, we may ultimately find out that neutrinos are Majorana particles. Observations of Type 1A supernovae from space will teach us much more about "dark energy," and the existence of additional dimensions may be established. There is much exciting work to be done, but I predict that it will all lead to a coherent picture within the next fifty years. Each member of HEPAP is personally invited to hold me to this promise.

Today we also recognise that high energy physics, or elementary particle physics if you prefer, is an integral part of the broad spectrum of the natural sciences, drawing on neighboring fields for tools and ideas, and contributing its knowledge, technology, and sociology to fields across the whole spectrum of science. Condensed matter physics, for example, underlies many particle detection techniques and provides insight into the ideas of spontaneous symmetry breaking, while accelerator technology has become essential to fields as diverse as chemistry, materials science, and structural biology. We have demonstrated to colleagues in other fields—for example, astronomy and the human genome—that the large collaborations so necessary for much of our research can indeed be scientifically productive, and we have given them the confidence to follow suit. We place tremendous demands on computing and networking and foster such modern marvels as the World Wide Web. In short, we live within a pluralistic scientific culture, breathing its air and helping it to flourish.

I say all this because I believe that the work of the subpanel and the deliberations of HEPAP at this meeting constitute a significant advance for our field. It is my hope that we can go forward from here united in our aims, confident in our ability to achieve them, and proud that, by helping to strengthen science in the United States, we are helping to keep our country strong.