FOREWORD

IN MANY DIFFERENT FIELDS, ranging from astrophysics to molecular biology, scientists have pushed back the frontiers of their research so far that important advances can now occur only by making huge investments in new equipment. This is certainly true of high energy physics. Having answered the "easy" questions, we now face the really tough ones—such as why quarks and leptons appear in three distinct families and sport the peculiar masses they bear. These are the kinds of issues that the abortive Superconducting Super Collider was designed to address and that CERN's Large Hadron Collider will take up early in the next century.

If we can learn one thing from the cancellation of the SSC, it should be that—given all the competing interests and demands on the public treasury that governments around the world must satisfy—it is unlikely that any single country will come up with the many billions of dollars, deutschmarks, or yen needed for the most advanced scientific projects, unless there are immediate economic benefits. The rewards of basic research, both the knowledge gained about Nature and its impacts upon future societies and economies, are available to all. Individual governments are still quite interested in supporting scientific research, but they are reluctant to foot a majority of the bill on their own when many others will benefit. Thus scientists have to find effective ways to share their major costs across national boundaries.

Scientific megaprojects that must be located within a single country, such as fusion reactors or particle accelerators, present a particularly thorny problem. As we learned from the SSC episode, support was widespread until a specific site was chosen in one particular state. How much more difficult must it be for governments to dip into their coffers to fund large facilities located in other countries? So far we have dealt with this problem in the high energy physics community mainly by sharing the detector costs while letting the host country or region pay for the accelerator or collider. But to build the multibillion-dollar colliders needed in the future, we must follow the lead of our European colleagues and learn how to share these costs, too.

The author and Hirotaka Sugawara, Director General of the Japanese High Energy Accelerator Research Organization (KEK), at the Next Linear Collider Test Accelerator being built cooperatively by the United States and Japan.

There is another problem to be faced as well—the global distribution of the biggest scientific projects. If it is unreasonable to expect any single country or region to support such a megaproject on its own, it is equally unreasonable to expect any country or region always to pay for projects built elsewhere. This is especially a problem for high energy physics. International funding and siting of our largest projects are more difficult than for projects such as deep-sea drilling, Antarctic research stations, and the Space Station, which have no specific national home. We have to look across all scientific fields—including, for example, fusion and nuclear physics—when considering the geographical distribution of gigantic facilities. Only in this way will there be enough megaprojects to achieve a global balance. Physicists don't like this "basket" approach, but politicians will find it more acceptable.

This special issue of the *Beam Line* is devoted to the question of international collaboration in high energy physics. It offers perspectives and insights on the programs in Europe, North America, and Asia. And it chronicles some of the international efforts currently under way to design and build the next generation of particle colliders and detectors needed to study physics at the trillion-volt energy scale. I recommend it to all people interested in the future of high energy physics.