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I am very sorry that I cannot be here in person but only in bosons without my fermions. Let me say a few words about the last 30 years, which have been a veritable triumph for High Energy Physics, a march from success to success. I choose the 30-year period because it started with the transgression of the GeV limit.

There are four important activities in our field: machine construction, instrumentation, experimentation, theoretical understanding. In the first, we proceeded from the early fixed target machines of a few GeV to the many hundreds of GeV regions for both fixed targets and colliders, and we are about to transgress the TeV limit. In spite of the greater energy loss, the electron machines are keeping pace with a factor 10 behind. This success represents a jump by a factor of 10, every decade. We should be proud of our accelerator builders and designers.

The great tradition of Lawrence, MacMillan, Veksler, Budker, Tuschek, Adams and Livingston is continued by many outstanding pioneers, but they do not get recognition and status they so amply deserve. They do not figure as co-authors in the publications of the discoveries which they have made possible; only a few of them have academic positions; hence, to the detriment of our field this activity does not attract enough young people. After all, in this period they provided us with innovative ideas such as strong focussing, separate magnets, colliding beam devices, stochastic cooling and superconducting magnets. Certainly the intellectual creativity is of the same level as the highly advertised theoretical achievements of that period.

The future is full of great promises. There are projects in various forms of concreteness reaching into the next factor of ten: the Soviet UNK projects, the Tevatrons, the SSC, the hadrons in the LEP tunnel, the linear collider, and perhaps some new unconventional methods of acceleration.

Now to the <u>instrumentation</u>. I only need to mention a few of the numerous innovations of the last 30 years: large bubble chambers and Cherenkov counters, electrostatic and RF separators, spark-, wire-, streamer-, drift chambers, liquid argon ion chamber, neutrino horns and, last but certainly not least, the ubiquitous use of computers. The tentacles into the future are clearly visible: short life time techniques with solid state chips, imaging Cherenkov's B.G.O. glass. All that will be needed to exploit the TeV-machines.

The list of experimental discoveries is impressive. I list only a partial selection: antimatter, associated production, violation of parity, the Ω^- and the ϕ-meson in the first decade; the hadron spectroscopy, the two neutrinos, C-P violation, the direct observation of quarks (deep inelastic scattering) in the second decade, the heavy quarks, the τ-electron, the jets and the W and Z bosons in the third. To speculate about future discoveries is futile. Anything unexpected may show up. One thing is almost sure: it will be much more and mostly quite different from what theory predicts. Recent observations at the CERN p-$\bar{p}$ collider suggest unexpected happenings already in the several 100 GeV region.

Now to the theory, it was an unusually successful time for theoretical predictions, so successful that there is a danger of developing an overconfidence in the power of theory--of telling us what future accelerators will produce. Theory anticipated parity violation, predicted the Ω^-, the charmed quark, the electro-weak connection and, last but not least, the existence and mass of the W and Z boson. Moreover, in this short period of 30 years several concepts and ideas were conceived that opened up large new horizons and led to a deeper understanding of the subnuclear world. Examples: the Yang-Mills field theory, the "eightfold way" leading to SU_3 symmetry, the development of QCD with asymptotic freedom and confinement, and the electro-weak unifications.

The tentacles into the future in theory are numerous, perhaps all too numerous. New ideas of unifications and generalizations are sprouting all over, G.U.T., SUSY, Supergravity, Technicolor, etc. Only experimentation will show which of these colorful theories will survive. We still are far from understanding where masses come from; the absence of monopoles and the refusal of the proton to decay threatens some of these new tentacles.

What is most remarkable, however, is the new bond between Particle Physics and Cosmology. Indeed, what we produce and observe at the targets and intersection areas, has not been realized in bulk by nature since the first few instants of the universe. Some reason to be proud! Let us not forget that all these triumphs were possible because of the constant financial support by the respective governments. We have not much reason to complain in view of the recent authorizations of such promising projects as the Tevatrons and SLC in USA., LEP, HERA, and the p-$\bar{p}$ collider in Western Europe, U.N.K. in the Soviet Union, all K.E.K. activities in Japan and the synchrotron facility in China. But we should not become too confident that such support will persist when the costs of future facilities will be much higher and the competition of other science much fiercer.

The last 30 years have also witnessed a through internationalization of High Energy Physics. Up to the '50's the USA had a kind of monopoly on the highest energy machines. That did not prevent a number of important discoveries to be made elsewhere with cosmic rays. But from the mid-fifties on, laboratories with accelerators at the energy frontier appeared in Western Europe, in the Soviet Union, and in Japan, so that High Energy Physics became indeed a truly international enterprise. A special significance must be attributed to CERN since it was the first great laboratory in this field that is internationally owned, run and paid for, albeit only by Western European nations. As such it represents an innovation in the sociology of science of which the Western Europeans are justifiably proud. Together with an analogous international effort at Dubna, it spawned other Inter-European activities in astronomy, space science and molecular biology.

The international world character of our field comes out more importantly in the exploitation of the nationally or regionally owned accelerators. All major accelerators around the world are used and exploited by groups of nationals of other countries or regions than the one which owns the machine. This international exploitation has become more important in the past decades because of the growth in size and cost of modern accelerators and of experimentation. It is no longer possible for one nation or region to have all types of machines necessary for the progress of the field. It is a financial necessity to have the different types of very high energy accelerators distributed over the regions of the globe. Duplications of facilities may be very useful for physics and convenient for the physicists, but we can afford them only for smaller scale machines. Work in other countries is necessary if research is supposed to cover the whole frontier as it should.

It is therefore of utmost importance that international exploitation is maintained and facilitated as much as possible. The situation is not too bad today, but could be better. The foreign groups are of necessity disfavored citizens in a certain sense. They work far away from their home bases, they are up against technical difficulties in a foreign laboratory where they have to rely on in-house help and support. This is mitigated by the fact that they often bring along their own unique instrumentation and that there has been a reasonable reciprocity in the use of facilities. But problems do remain and may get more serious when there will be a scarcity of experimental areas, and the construction time of experiments becomes ever longer. This is to be expected with the new giant projects, where installations and instrumentations cost more than several accelerators of the old style.

One way of avoiding the "disfavored citizen" syndrome would be the founding of a "world-facility" owned and operated by all interested nations on equal terms. A world machine was proposed and discussed since the inception of CERN. I myself, among many others, was a promoter of this idea. Experience suggests, however, that the political, managerial and financial problems of a world machine may be cumbersome and risky. At this stage High Energy Physics is probably still better served by national or regional machines, where those problems are less severe.

Collaboration between a group of nations, like it is planned for HERA are of course highly desirable. After all, that is what CERN is and its success proves its usefulness. Still, we should not abandon the thought of a world machine. Comes a time when the cost and effort of the next accelerator is so high that there may be no other way but world cooperation. Let us not forget the human significance of such a future venture. It may serve as a symbol of better relations between East and West, in the sense that CERN was symbol of Western European unity and cooperation. Indeed, this symbolic value was an important reason for its generous governmental support.

Reliance on regional or national projects brings up the difficult question of "who should do what at the energy frontier", with all the awkward problems of world planning, of competition, duplication, location, distribution, and desire to be at the frontline. We are now in the midst of these problems. There are a few fundamental principles involved here which are somewhat contradictory or, let me use the more appropriate term, complementary. What are they?

Obviously, competition and desire to be at the frontline are good things. They are an essential part of the driving force of science. Pure love of knowledge, independent of who found it, ought to be but is not the only driving force. But, if High Energy Physics as a supernational human endeavour is to survive, those drives must be channeled and not be allowed to obstruct the developments in other regions. There is one important principle that we must not forget: a serious decline of High Energy activities in one region affects all other regions in due course. The support of our field is based on a very tenuous base; it is wonderful that governments do spend so much for a pure idealistic purpose (not so pure, it provides unique challenges to science and industry that pay off in other applications). But a decline in one region may induce the governments in another to stop the support: "Why should we consider something to be important if others do not?"

Under these conditions it is important that different types of those large accelerators are distributed over the world and that each region has its specific machine or machines. Hence, it may be tempting to think of an international body that coordinates the constructions and distributes "rights" to build this or that accelerator. However, there are problems with such a solution. Perhaps it would avoid some of the troubles coming from duplication and harmful competition, but it would stifle the initiatives and the forward drive of regional and national groups and may end up in counterproductive squabbles.

But the world community of High Energy physicists should be strong enough to solve these problems without "regulative agencies." So far it went pretty well, simply by informal and semiformal discussions such as those at ICFA, by intelligent foresight, sympathy and actual help, technically and financially, for the endeavours of others. It has prevented most, if not all, unnecessary duplications in the past, it has led to a reasonable development where each region contributed in its own way to the progress of the field and had open doors for foreign groups.

The higher the cost of a single machine, the harder it will be to maintain the situation. Danger points are already visible today.

The dangers are caused by a very positive fact: Every region is eager to extend the energy frontier and many such projects are on the drawing boards. The two most ambitious ones are the use of the LEP tunnel for hadron collisions up to 10 TeV per beam, and the plans for a 20 TeV per beam hadron collider in the USA, the SSC. These projects are still at a very early stage of research and development. The trouble comes from destructive interference effects on the attempts of getting governmental support. An early drive at CERN to attempt the highest possible hadron energies in the LEP tunnel would jeopardize the chances to get the SSC in the US; American efforts towards a SSC would make it much harder to get Western European Governments to finance the use of the LEP tunnel for hadron collisions, in addition to the exploitation of the lepton collision by LEP I and LEP II. Clearly there are problems on both sides: the USA needs a vigorous project of assured technical feasibility so as to not suffer a decline in its activities with the previously mentioned detrimental effects on World High Energy Physics; CERN would like to see a future in hadron collider physics which, after all, was pioneered by them. But that situation is conducive to negative human responses.

Furthermore, it was a great idea to develop linear colliders at SLAC they may be the answer to reach super-high electron energies. The resear and development at SALC is certainly one of the promising innovative activities, in the interest of World High Energy Physics. It may be a legitimate spur to this largely accelerator-oriented program to perform e^+e^- experiments at the energy of the Z°. But it does not, to my mind, justify the expenditure of large sums on detectors, especially as the Europeans are putting such a massive effort into LEP and its facilities. This is again conducive to negative responses.

Science is a human effort and any human activity carries along huma difficulties, stuff for frictions and tensions. Our field is no excepti Because of our great successes in the past, both in science and in world cooperation, we have a special duty to maintain this spirit and to be sensitive to the effects on the other regions of our regional actions, projects and dreams.

The world community of High Energy Physics must get together in one way or another, and reach a solution of the problem of what should be done where, with the financial, intellectual and technical resources that we expect to be available. It must be the responsibility of the community to find the solution that is best for the progress of our field, best to maintain the enthusiasm of all participants, and best to attract many young people in the field. There is time enough to find a reasonable solution in the coming few years. All these projects are still on the drawing boards only, and we do not know enough today about the technical and political possibilities and about ways of cooperation. In all probability a realization of both projects at the highest energy is excluded within the next decade.

But it is the duty of the community to come to a mutually acceptable solution. It is an issue of scientific responsibility versus scientific greed. But it is also an issue of wise policy towards the governments who pay the bills. We certainly will loose the support that we have received in the past if it appears that different parts of the world community are trying to out-pace each other and are no longer cooperating in the planning and construction of the future accelerators with mutual help and assistance. The danger is all the more acute since even under the best conditions, this support is not assured.

The task is not easy. Most probably the region between 2 and 40 TeV will be full of unexpected phenomena. Certainly it would be desirable to have more than UNK and one other hadron facility in that energy region; if HERA will turn out interesting new results it would also be desirable to go to higher p-e energies which could be done in the LEP tunnel. But can we afford all this without ruining the field by expanding too fast and asking for too much? These are difficult problems whose solutions require foresight, political acumen and wisdom to a far greater extent than the dilemmas of the past.

Looking at the situation from my own distant point of view, which is further away from the daily, monthly, and yearly struggles in which you all are immersed, I find our field full of strength from past successes and future promises. The problems and the clashes of interest stem from an overflow of ideas, projects and possibilities, from an "embarras de richesses" rather than from internal weakness. We have reasons to be proud of our world community in the past. Let us keep our standards of cooperation and mutual understanding. Only then will we be able to continue our great search of the innermost structure of nature.