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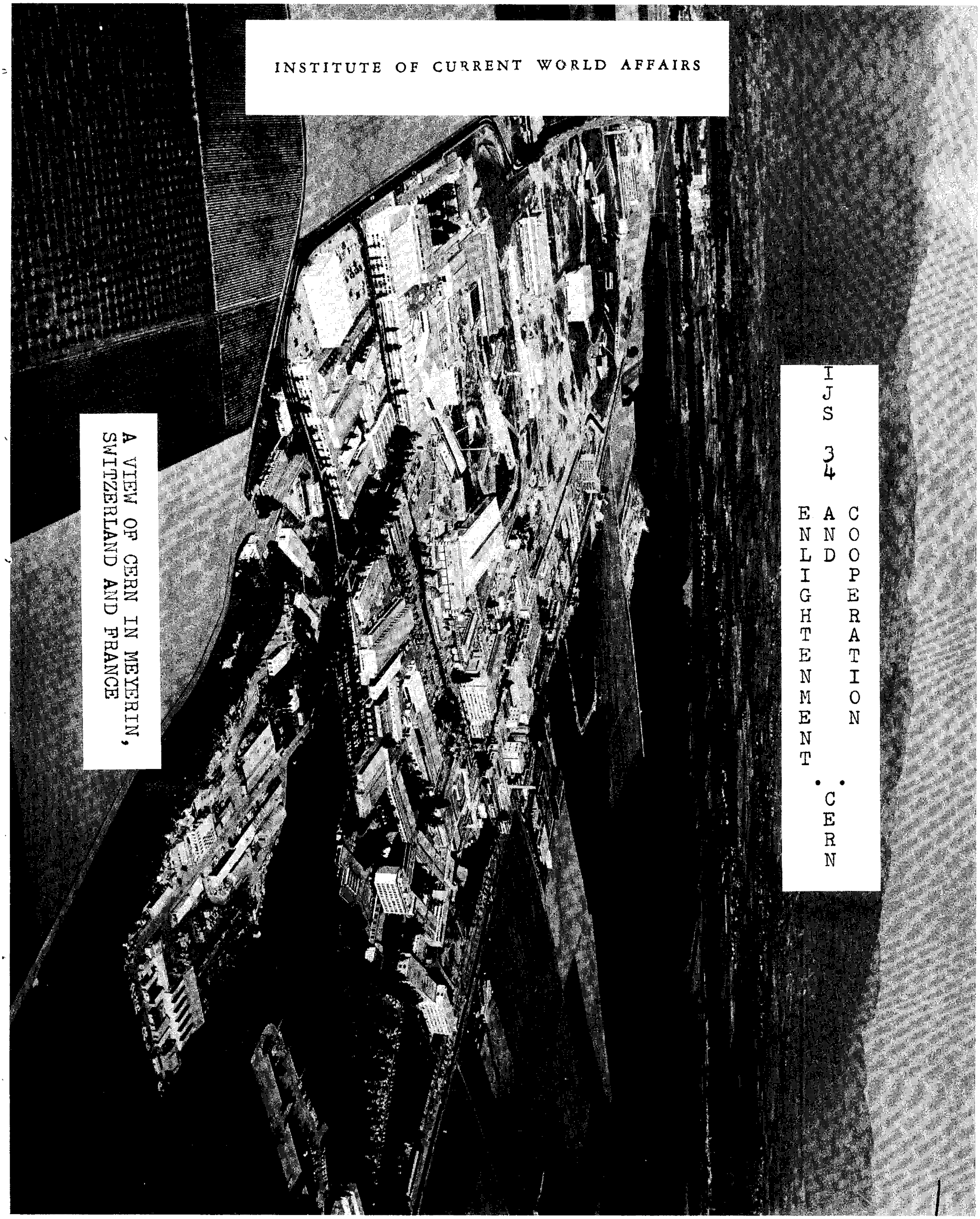

IJS 34

COOPERATION AND ENLIGHTENMENT : CERN

A VIEW OF CERN IN MEYERIN, SWITZERLAND AND FRANCE

INSTITUTE OF CURRENT WORLD AFFAIRS

IJS - 34 NOTES ON ENLIGHTENMENT AND TRANSNATIONAL COOPERATION II: CERN

P. O. Box 14246
Nairobi, Kenya
13th April 1973

Mr. Richard Nolte
Executive Director
Institute of Current World Affairs
535 Fifth Avenue
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Dear Mr. Nolte:

Attached you will find the second installment of a four part series about the problems of transnational cooperation in matters of enlightenment.

This second newsletter describes the activities of the European Organization for Nuclear Research (CERN) and suggests some lessons which one can learn about the operation of multinational, cooperative ventures.

Since this series is a continuing essay, I use continuing pagination to relate this part to the whole.

I think that this report about the activities of CERN provides some support for my argument in favor of limited purpose, multinational institutions.

Sincerely,

Irving J. Spitzberg, Jr.

II. CERN

The European Organization for Nuclear Research (hereafter referred to as CERN) was officially founded by a Convention signed in Paris in 1953 and which came into force on 29th September 1954. CERN was organized to provide research facilities for high energy physicists in Europe. It was created as a response to the research needs of European physicists as perceived by them and some of their American colleagues, both groups feeling a profound commitment to the idea of international cooperation in post-war Europe.

Two facts of life at the time of the founding of CERN continue to be important in understanding its past success, present problems and future possibilities: first, the fact that high energy nuclear physics requires complex, huge, and expansive research tools in order to be pursued; second, the fact that after the Second World War there were a number of internationally famous and prestigious nuclear physicists with a commitment to high energy physics as a field.

The first fact of life in nuclear physics -- the need for hugh machines to accelerate high energy beams of particles -- meant that the investments required to build machines adequate to advance the state of the science were beyond the financial capabilities of any post-war European country; and the ever increasing size of the machines and increasing costs has meant that it has continued to be impossible for an individual European country to support its own high energy physics program as a separate and independent entity.

The second fact -- the involvement of prestigious physicists as founding fathers -- meant that the high energy physics community had the ear of governments at a time when they were still sensitive to the lessons of the Second World War in regard to the potential role of physics research of all kinds, no matter how abstruse, to the technology of modern warfare; a sensitivity enhanced by the cold war in the early fifties. E. N. Shaw, presently head of information at CERN but previously a distinguished British science journalist, puts it: "CERN was to be Europe's scientific insurance policy". And one might add that the reason Europe bought on such a large scale was that the insurance salesmen were so famous and important. Europe may not be buying on the same scale because the "salesmen" are no longer such great men and the insurance is no longer deemed so important; two changes not yet clear to those attempting to sell the policy. (For more on the history of CERN, see R. Jungk, THE BIG MACHINE.)

The relationship between the scientific community and governments in the operation of CERN has been important to its past success and current problems. Each of the participating countries (which presently include Austria, Belgium, Denmark, France, the Federal Republic of Germany, Greece, Italy, the Netherlands, Norway, Sweden, Switzerland, and the United Kingdom) nominates two representatives to the Governing Council: one a scientist, the other a representative of the administrative agency involved in science policy in the particular government or a foreign service officer. So governments and the affected scientific communities have equal voices in the policy

making processes of CERN. And these policy making processes seem to be informed by a great deal of good will among all concerned. Also, the technical, scientific decisions are all made by the scientific community itself. The Governing Council sets budget and general program guidelines, but the scientists have complete control over CERN's experimental activities. This scientific control means that there is a minimum of scientific complaint about outside interference. But the deference to scientific judgment in the history of CERN has meant a certain naivete on the part of scientific policy makers in dealing with the international politics of enlightenment in the recent past; I shall return to this point in a moment.

A number of characteristics of the operating policies of CERN have contributed to a reputation for success among both administrative and scientific representatives of the various countries involved. And many of these characteristics distinguish it from other international and multinational organizations. First, there is the attitude of engineers and scientists attached directly to CERN, which is that they are there to provide a service to the high energy physicists of Europe, not to dictate a research program themselves. All of the experiments performed on the three accelerators in Geneva are conducted by teams of physicists including a majority from outside of CERN. Indeed out of a high energy physics experimental community of approximately 1200 professionals in Europe dependent upon the CERN machines (some 60% of the total and now a fairly steady number), only 50 can be characterized as permanent staff at CERN. The rest of the community will be participating in the activities of CERN through medium term contracts (about 100), appointments as Fellows and research associates (about 200) and externally funded participants (about 650 at any one time, plus another hundred from non-member states, notably the U.S.A.). So CERN clearly does provide a service resource which is drawn upon regularly by the physics community throughout Europe, and by others in the world as well -- especially the Russians and the Americans.

A second characteristic of CERN operation is the sophistication and equity of the engineering program. Much of the work at CERN requires an ongoing engineering program for the construction of facilities for experiments. Presently a gigantic accelerator, the 300GEV, is being constructed and with it a new laboratory called CERN Laboratory II. These massive and expensive engineering projects have required the development of sophisticated procedures for management and construction of projects with international participation. One of the cardinal rules of contracting at CERN is that all contracts are let strictly upon consideration of cost, quality and delivery date, never upon considerations of contract allocation among participating countries. The Director of Administration at CERN, Mr. G. H. Hampton, called this particular rule the source of the success at CERN in providing international class research facilities. In addition to this operating procedure, there has been a

tradition at CERN, unlike most other governmental or international organizations, to estimate the cost of projects accurately. Most construction is completed within cost estimates or with a variation over very long term projects of no more than 10% of the original cost estimates. Also, projects are usually completed on time. Both the rule of purchase and the management expertise have contributed to the trust between the Governing Council and the scientific management at CERN.

Just as contracts are let strictly according to relevant criteria for the best buy, the access to experimental opportunity at CERN is quite evenhandedly controlled. Decisions about access to the various machines are made by a scientific committee which is divided into subgroups dealing with the constituent machines and techniques of measurement. Each subgroup and the scientific committee as a whole are chaired by persons with no present affiliation with CERN. Conversations at CERN and in participating countries indicate a rare unanimity of opinion about the fairness of the research committees at CERN and the opportunity for access to various machines. To put this attitude in proper perspective, it should be noted that it is a very rare occurrence indeed for an experimental proposal to be turned down completely; the negative decision is usually one of delay in implementation only. So there is little cause for dissatisfaction. But the system of allocating experimental time itself deserves recognition for its operation in a competitive, multinational forum.

A final characteristic of operation which has contributed to the overall success of CERN as a multinational enlightenment institution is the manner in which the burden of financing is apportioned. Each contributor underwrites a portion of the budget in relation to its net national revenue in comparison with the other participating countries. This formula has endured, with only limited modification, since the initial agreement was signed. There have been disagreements about the financing of various projects (especially CERN Laboratory II, to which I shall return), but once a project is approved, the equity of the distribution of obligations has always been adhered to.

Each of these characteristics of operation at CERN has contributed to an overall reputation for success among the governments involved. And although it is difficult to measure success in terms of research output, it is clear that the work which is done at CERN is respected in the international physics community. But in case this description and analysis leads the reader to think that all is always right in and with the CERN world, in the interest of a balanced report and analysis, we must look briefly at the most important decision taken at CERN in recent years: the decision to build CERN Laboratory II, the 300GEV accelerator, which will be one of the most powerful accelerators in the world when it is completed in 1976.

The important aspect of the decision in regard to CERN Laboratory II, which was first suggested in the mid-1960's, is that it involved CERN in

transnational politics of a sort which seems to be usually absent from its activities. The issue was twofold: whether to build a new, extra high energy, super proton-synchotron, which would be the next generation or to continue with the existing facilities; and if the decision were made to build the new accelerator, where it ought to be constructed. The two issues became inextricably intertwined.

The British, in 1968, during a period of financial austerity and priority reassessment in science policy under Anthony Wedgwood Benn and the Wilson Labour Government, turned thumbs down on the whole enterprise. This negative decision by Britain brought consideration of the whole project to a halt; although it is interesting to note that the negative decision by the British Government was reported to the CERN Council by Sir Brian Flowers, the chief of Britain's major science policy body -- the Science Research Council -- who then made a personal statement to the CERN Council. He said that he and his scientific colleagues hoped that CERN would decide to go ahead with the project; a most unusual statement of disagreement between political and scientific representatives from a member state. For a time it seemed possible that the project would go ahead as a six nation project, but disagreement about location of the site among the five participants who had offered a site resulted in the decision being continually postponed.

The British decision and the subsequent six nation indecision were indicative of the changing attitude toward science policy in Western Europe. Science for science's sake, regardless of cost, was no longer to be the guiding principle of governmental policy. Or, to continue the metaphor of the insurance policy, the premium would no longer be accepted unchallenged. This change in public governmental attitude had not been anticipated by the leaders at CERN; indeed they had been naive in their request for a huge new plant.

But after the British decision and the recognized failure to get agreement on the basis of six participants, the leaders at CERN, under the guidance of an old CERN hand and British scientist, John Adams, drew a revised plan for a 300 GEV accelerator based in Geneva, using the existing laboratory facilities as its base, which was much less expensive. This new and revised plan for CERN Laboratory II was approved in 1970 and construction is now underway. Also, CERN has returned to its usual policy situation where national interests seem to be subservient to the interests of the international physics community. (This account of the decisions leading up to CERN Laboratory II owes much to conversations with E. N. Shaw, the public information officer of CERN, and Dr. J. B. Adams, presently in charge of CERN Laboratory II.)

A crucial lesson to be drawn from the decisions leading up to CERN Laboratory II is that transnational institutions with an interest in

matters of enlightenment cannot assume the persuasiveness of their needs in competition with the wide range of claimants on national public funds. A lesson still not completely clear to CERN leaders. In conversation with Mr. Hampton, head of administration, and Dr. Zilverschoon, director of the proton-synchotron group and also planner for CERN activities, no clear answer was given to a question about why a government should support high energy physics in competition with other demands, nor was an answer given to a question about how one could evaluate the success or failure of the investment in physics. It seems to me that developing answers to these questions is crucial to the future of CERN. And similar questions and answers must be of concern to all transnational organizations concerned with issues of enlightenment.

The questions about the benefit and efficacy of enlightenment activities are relevant to two different constituencies in member countries of CERN: first, the physics communities and second, the public at large. The rule of thumb of commitment of resources in CERN member states was that a country should be prepared to invest twice as much as it spends on CERN activities in support and related work in the country itself. Or in other words, one-third of all money invested in high energy physics for each country left the country and went to CERN. And although I do not have the exact figures in hand, I know that the money invested in high energy physics in CERN member states is a relatively large sum when compared to the money invested in all scientific research. Now most national science budgets have reached a steady state in percentage of national budgets; so CERN's budget is tight but the percentage of national science budgets it represents is still substantial. So justification in terms of good physics is important. But a further justification is necessary as well: the return on the money to the enlightenment activities in general of all of the participating countries. No such justifications were forthcoming in my conversations at CERN.

Although formal justifications were not forthcoming in Geneva, when one looks at the overall activities of CERN he can find much to commend it as a multinational institution serving a clearly identifiable need and giving a sound return on the enlightenment Pound, Franc, Mark, or Kroner. It is the clear definition of CERN's role which at once makes it most attractive as a multinational, cooperative enlightenment venture but at the same time makes the lessons one draws from its operations less generally applicable than might otherwise be the case. The fact that high energy physics must have very expensive, large machines, which are clearly beyond the means of individual countries is the factor which has most contributed to CERN's success. If CERN did not exist, it is likely that high energy physics research would not exist in Europe either.

But it is the existence of the big machines in one place, and a relatively pleasant place at that, that has allowed CERN to become not only the experimental center for high energy physics in Europe, but also

the central communications point for the physics community in Europe as well. One could say that if CERN did not exist, but if the machines did exist in various places, the physics community would have to devise the communication facilities which CERN provides. So there is a fundamental justification for multinational and even international institutional arrangements on the model of CERN to facilitate the enlightenment process in high energy physics.

The most important practical lesson one can learn from the experience of CERN is that transnational cooperative ventures in enlightenment are most likely to succeed when the emphasis is on service to national constituencies which cannot provide the particular service for themselves. This lesson is complemented by the example of the operating procedures of CERN, which have contributed to its successful provision of the service: e.g., the rule of contracting according to quality and cost; the guarantees of fairness of access to the services; and the commitment to providing best estimates of potential costs and staying within agreed to budgets. These are modes of operation which are rarely followed by transnational (or national, for that matter) organizations.

A final observation to be emphasized once again about CERN and its role in Europe is its contribution to an important transnational communications system. Most disciplinary communities of scholars have a number of lines of communication which are transnational in character: journals, visits, conferences, etc. But few disciplines have the central resource which in turn provides center for both formal and informal exchange of information. Some wags at CERN say that more nuclear physics is done in the cafeteria than on the accelerators. Strategically located cafeterias may be an important contribution which international and multinational organizations can provide if their missions and functions are clearly defined and if they serve a highly visible (at least internally so) constituency. Many international organizations -- such as UNESCO and OECD -- attempt to provide such a forum, but few provide it as effectively within a transnational enlightenment process as does CERN, probably because CERN provides its communications services as part of its larger provision of research and enlightenment opportunities which are clearly important to the participating countries.

Because of the importance of this communications service and the role which a limited scope, multinational organization can play in it, it is worthwhile to look at another and equally promising approach to the development of communications systems: the Nordic Cultural Convention. It is to this fledging enterprise that we must next turn.

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