## WHAT IS WRONG WITH THE CHICAGO PROJECT

This memorandum does not deal with the essential causes of the difficulties which hinder our work at Chicago. Those causes do not lie in Chicago, but lie in the general setup of the Washington end of our organization and their removal therefore does not lie within the authority of A. H. Compton, who is in charge of the Chicago project. Nevertheless there is a possibility of improvement at the Chicago end even within the limitations which are imposed upon us. For this reason I shall analyze in the following the situation at Chicago with as little reference as possible to the troubles which have direct origin in Washington.

We have at Chicago a planning board which meets under the chairmanship of Compton and a technical committee which meets under the chairmanship of Fermi. Allison, Fermi, Szilard, and Wigner are members of both of these committees and some members of the project might therefore assume that they are jointly with Compton directing the Chicago project. The fact, however, is that these committees were nothing but shadows and the major issues were either decided without adequate consultation with these committees, or that the major issues which would have required a decision at the very latest at the time when it became apparent that K will go over 1, were simply left undecided up to the present day. It seems to be necessary to substantiate this statement.

We knew for a long time that there are three possible ways in which the power plant could be cooled: by helium, by water, and by bismuth. The question whether these three systems should be worked out simultaneously on paper, possibly up to the blue print stage. or whether one of them should be worked out in preference to the others, and which of the three systems should be given preference in this respect, was never put up for decision to these committees. It is my personal opinion that it is not possible to judge the relative advantages and disadvantages of any of these three systems until these systems have been worked out in detail, though not necessarily as far as the blue print stage. In addition, in case of the water and bismuth cooling certain simple technological tests have to be made before the building of the plant can be given serious consideration. It is further my personal opinion that the right way to proceed consists in having three independent groups, each of them comprising physicists and engineers, to work simultaneously on plans for these three different systems. While I personally feel that I can contribute most towards developing the bismuth cooling system since I have more faith in this system than the other two systems, I am quite aware of the fact that this may be a purely personal preference and do not have any opinion as to which of the three systems will prove to be the most successful or can be made to work fastest.

What actually happened was this: An engineering group was added to our project and this group started to work on plans for the helium cooled system. Nobody knew why the helium cooled system was given preference by this group but it was everybody's impression that somehow it was decided to build a helium cooled system first and to place orders for the rather heavy accessory equipment which this system would require. In the meantime, Mr. Wigner and his

division became interested in the water cooled system, but the question whether he would be willing to assume responsible for developing this system, if necessary to the blue print stage, was never put up to him and remains undecided up to the present day. An engineering staff would have to be added to his division in order to produce usable plans for a water cooled unit and this staff should as quickly as necessary be brought up to include at least three good engineers in order to establish a proper balance between physicists and engineers in Wigner's division.

I myself was quite prepared to develop the bismuth cooled plant into the blue print stage, but felt that this work would be futile unless the metallurgical problems which are involved were cleared up simultaneously. In a conversation which I had with Dr. Compton I understood that he was in full agreement with this procedure and with the help of Dr. Compton we succeeded in having Foote released from Cooper Union. He arrived on August 1st and immediately started to study the bismuth steel system. A short time later Marshall and Creutz were ordered to go to M. I. T. to look into the question of fusing Dr. Alexander's metal by means of an induction furnace which is in operation at M. I. T. Since this would have completely wrecked the technological work on the water cooled system, I proposed to send Foote (in place of Creutz) to Boston for two weeks so that they could make a thorough investigation of the situation. About a month ago, after the first successes of the magnesium ore at Cleveland, I visited Foote and Marshall in order to form a balanced opinion whether their presence in Boston or their presence in Chicago would be more important for the success of our project as a whole. I came to the conclusion that they ought to return, or at least a

date should be set for their return so that it should be possible to make plans accordingly. Repeated attempts were made in the last four months to have such a date set, but up to the present without success. In the meantime, work on the bismuth plant came to a complete standstill.

While I was under the impression that the helium cooled unit had been worked out in detail and that we were about to place orders and therefore did not continue with the study of this type of cooling with which I concerned myself at one time. I suddenly learned that we were being given the task of expressing an opinion whether a helium cooled plant should be or should not be built. I personally see no way in forming a sound opinion on this question at short notice. I possibly could have formed an opinion if I had followed the development of the helium plant for the past two or three months. I would have been very glad to do so if I had known that it would be necessary for me to express an opinion on this subject.

In the preceding I have attempted to give an illustration of the way in which things were happening in Chicago in the past and as time progressed, since the start of this project, more and more members of the planning board and the technical committee refused to be considered responsible for what was happening. There was more and more shrugging of shoulders among the group leaders and parallel with that an increasing tendency of narrowing down their responsibility to this or that detail of the work in which they have been explicitly interested.

To all this came an increasing tendency of compartmentalization of information imposed upon Dr. Compton by Washington with the in-

The choice of the membership of this committee causes no difficulty. The technical committee as it is composed today could very well fulfill this purpose. The difficulty lies in finding a chairman who has all the qualifications required, which includes that he does not dislike to be chairman and that he does not hate committees more than they deserve to be hated. In my opinion neither Fermi nor Wigner nor myself are suitable persons for this job. We should therefore have to look, preferably for somebody who has so far been outside the "inner circle" and who is sufficiently energetic to assert the authority of the committee and see to it that its recommendations are either clearly rejected or promptly executed.

It would probably be best to deal with this matter in an experimental way rather than to change the existing committees and I shall submit a proposal to this effect to Dr. Compton and the members of our group.

In summarizing, we could say that in the past the men who were formally in charge of a division were not given the feeling that they had a responsible position and that they were running the project. There was no mechanism for reaching decisions and consequently decisions were reached in a haphazard way, essential decisions being omitted or taken many months after they were due. If the technical committee in its present composition, or perhaps in slightly modified form, could carry the main burden of the project and if in turn the technical committee would report weekly to a larger body of group leaders, not exceeding fifteen or so, there would be a very rapid change for the better in the present

situation. Compartmentalization of information which interferes with the functioning of such a setup would have to be removed if our project is to succeed.