

The Rockefeller Foundation's Decision-making Process in Funding the 184-inch Cyclotron

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(Translated by Barbara Sugihara)

War broke out in Europe at the end of the 1930s, and the United States was on the verge of joining in when, on April 3, 1940, the meeting of trustees of the Rockefeller Foundation (RF) decided on a grant of \$1,150,000 to support the construction of a new 184-inch cyclotron at the University of California. This paper elucidates the process leading up to that decision.

The decision-making process can be divided into three stages: The first, beginning in October 1939, saw initial enthusiasm for the giant cyclotron project; the second, lasting until February 1940, involved changes in the foundation's internal circumstances and limitations on funding; the third, which began in early February 1940, saw specific steps toward the materialization of RF support for the project.

Enthusiasm for the Giant Cyclotron Project

On October 27, 1939, Warren Weaver, Director of the RF's Natural Sciences Division, recorded in his diary that Ernest O. Lawrence had come East and that they had discussed Lawrence's plan for an enormous cyclotron. Whether this was their first consultation on the matter is unclear, but subsequent events indicate that Lawrence drew up the cyclotron plan on the basis of Weaver's advice on this occasion.

Among other things, Weaver requested Lawrence's assurance that even if the cyclotron were installed at the University of California, it would be available for all of science, making it very important that the machine not be planned on too small a scale. He also recommended that operating expenses for a period of ten to fifteen years be clearly indicated at the outset of the plan. Lawrence had given a figure of \$750,000 for the project's main expenses, but Weaver indicated that a request for \$1,500,000 would probably be granted. The discrepancy between the two figures reflected different calculations: Lawrence had not included operating expenses after completion of the cyclotron, whereas Weaver reckoned that operating expenses for a period of ten to fifteen years would total about \$500,000. In short, at this juncture Weaver seems to have already estimated that the main expenditures for constructing the cyclotron would come to \$1,000,000.

Weaver's bold advice hints at his enthusiasm for the giant cyclotron plan, an attitude that may have been partially influenced by Lawrence's reports of other scientists' favoring the project, including Karl T. Compton (president of Massachusetts Institute of Technology), Frank Jewett (president of the National Academy of Sciences), and Alfred L. Loomis. At this meeting, Lawrence told Weaver that Jewett had declared that the National Academy of Sciences would probably be delighted to back the project.

Weaver seems to have been especially influenced by Compton's and Loomis's comments. The December 14 entry in Weaver's diary records the conversation at a luncheon at Loomis's penthouse.

Loomis, who had returned from a three-week visit at Lawrence's laboratory at Berkeley, seems to have used this occasion to fan Weaver's eagerness to promote Lawrence's cyclotron project.

That Rockefeller Foundation President Raymond B. Fosdick shared Weaver's enthusiasm for Lawrence's plan is clear from documentary sources, and it seems that the continuity of Weaver's enthusiasm was linked to that of Fosdick, or at least Weaver expresses such feelings in documents examined below.

In a letter to Fosdick dated November 14, 1939, Dave H. Morris, vice president and treasurer of Research Corporation, says that when they last met, he had been excited by Fosdick's statement that, as RF president he would advise the trustees to consider funding the huge cyclotron if Lawrence decided to go ahead with his project. In this letter, Morris estimated that the project would require some \$900,000. Figuring that the University of California would put up \$250,000 of this, he notes that the remaining \$650,000 would have to be obtained during the three-year construction period. At the time this letter was written, Lawrence had been chosen to receive the 1939 Nobel Prize in physics. Morris predicted that the young Nobel laureate would pioneer new scientific fields with his giant cyclotron, accomplishing great things for humanity. He boldly prophesied that in the future, Lawrence's name would be ranked with Newton's. Having said this, Morris warned Fosdick that if the RF did not want to support the project, he personally would endeavor to obtain support for it from other sources.

Undoubtedly, this must have fanned Fosdick's ardor. The RF's internal circumstances at this juncture can be glimpsed in his reply to Morris on November 15. Fosdick states that on November 14 he had finally been able to talk to Weaver about the matter and that, although he could make no firm promises at this point, he could assure that both of them were genuinely interested in Lawrence's cyclotron plan, clear indication that the two RF officers were enthusiastic about the project.

In this regard, a meeting of the Foundation's Trustees held on December 5-6, 1939, nominated Karl Compton and Robert Sproul, presidents of Massachusetts Institute of Technology and the University of California, respectively, to serve as members of the Rockefeller Foundation for three-year terms. At a meeting of RF members on April 3, 1940, they were officially elected to be members, simultaneously becoming trustees. This had been agreed upon by Weaver and Frank B. Hanson, associate director for the Natural Sciences, but it also indicates that, at this point in time, the Rockefeller Foundation considered the two universities to be the most important bases for physics research in the United States. Because of this, the formal decision to support Lawrence's cyclotron project, which came the following year, can be viewed as constituting the foundation's opportunity to include basic physics, and nuclear physics in particular, among the fields for which it provided regular support.

Altered Internal Circumstances at the Foundation Lead to Funding Limitations

The enthusiasm shown for the giant cyclotron project in the autumn of 1939 appears, however, to have waned by February of the following year. The documentary sources are complex, but they clearly reveal two sides to Weaver's attitude. On the one hand, to outside members Lawrence and Sproul, he repeatedly explained the difficulties of supporting the project, which would seem to indicate that his ardor

had cooled. To RF insiders like Fosdick, on the other hand, he continued to show enthusiasm for it. As will be seen below, Fosdick's attitude had clearly changed since autumn.

In short, the two men differed in their perceptions of Lawrence's cyclotron plan, a difference that seems to have stemmed from their respective positions in the RF. As president, Fosdick had to consider the RF's overall finances and all the fields it supported. On the other hand, Weaver, as director for the Natural Sciences, was basically in a position that required a grasp of only that division. In short, the "waning enthusiasm" under discussion here seems to relate closely to the internal circumstances of the foundation as a whole. Weaver's diary sheds light on what transpired during this period.

For three days, beginning on January 7, 1940, Weaver visited Berkeley to consider Lawrence's cyclotron plan in detail. He carefully studied the technical aspects, including the design, then the specifics of the budget estimate. Lawrence viewed the Radiation Laboratory, which was developing and operating the University of California's cyclotron, as a single unit. Weaver again stressed the importance of adding in the operating expenses that would be necessary after the 184-inch cyclotron was completed. Thus the cyclotron proposal seems to have been drawn up jointly by Weaver and Lawrence.

President Sproul, accompanied by four university trustees who were interested in the project, attended a luncheon held on the last day of Weaver's stay. On this occasion, Sproul said that if the cyclotron project could get funding to cover its main costs, the university was prepared to budget \$86,000 annually for operating expenses after completion. Weaver stated that it was highly unlikely that the Foundation would put up the entire \$1,500,000 that he had estimated in November. He added that, in view of the great interest and importance of the project, there was a possibility that the RF trustees would want to fund it, and he promised to take the draft plan back to New York for consideration. A question was raised as to the possibility of the RF granting \$1,000,000. Weaver stated, as his private opinion, that this was within the realm of possibility. At the back of Weaver's mind was the encouragement and enthusiasm Fosdick had shown in November.

Nonetheless, the January 19 entry in Weaver's diary indicates that Fosdick's ardor had cooled. On that day, Fosdick had told him that, although he still agreed that this project was the most interesting and important in the natural sciences, considering the foundation as a whole, \$500,000 was the most it could put up at this point. This being the foundation president's view, Weaver could not reject or ignore it.

Thereafter, Weaver gave the appearance of falling in line with Fosdick, adopting a stance that made it look as if his own interest in the project had also diminished. On January 23, he sent Sproul a letter explaining that on returning from Berkeley, he had found that during his short absence from New York a variety of factors had changed, namely, that both the foundation's financial circumstances and the global situation had deteriorated. During the previous two to three years, income from the foundation's basic assets had declined, and special outlays for the war were a future possibility. This state of affairs would make it utterly impossible for the foundation to grant the cyclotron project \$1,500,000, although there was still a reasonable possibility of \$500,000. In other words, because the Foundation could not be the project's sole supporter, it would welcome efforts by the University of California to find other sources of

funding. In this letter, Weaver repeatedly told Sproul that “circumstances” had forced the RF to give up on supporting the giant cyclotron project single-handedly.

On the other hand, he wrote to Fosdick, who was vacationing in Florida, saying that his own interest in the cyclotron project remained unchanged. The correspondence between Weaver and Fosdick reveals the foundation’s internal situation at this juncture. Writing to Fosdick on January 25, Weaver expressed regret at Fosdick’s declining interest in the project, saying that if there had been more time to discuss the matter after his return from Berkeley, he would have been able to keep Fosdick’s interest alive. He went on to say that, as things stood, that is, as long as the Foundation could not put up the entire amount, Lawrence would have to search for funding from other interested parties. Because this would take considerable time, presenting the cyclotron plan to the meeting of trustees in April would, of course, be impossible. The only possibility of it being submitted in April would be if the foundation would agree to allocate money from capital for the project. Weaver asked Fosdick if there were any possibility of: 1) appropriating \$250,000 from the Natural Sciences budget for 1940 and the remaining \$750,000 from capital or 2) appropriating \$600,000 from capital and adding to this \$200,000 from the Natural Sciences budgets for 1940 and 1941, e.g. a total of \$400,000 from this source. Weaver went on to say that he considered the giant cyclotron project to be the best opportunity for support that he had ever seen, an indication of the extent of his desire to see it materialize.

Also on January 25, Weaver drew up a questionnaire seeking an evaluation of Lawrence’s cyclotron plan from Compton and a number of other scientists in physics and related fields. He had judged that for the RF to supply a major portion of the \$1,500,000, it would need justification in the form of approval by a large number of scientific experts; in other words, not the subjective evaluation of RF insiders but an objective evaluation from outside. The evaluation of such specialists, however, is not necessarily objective, as one trustee later pointed out to Weaver: These were nothing more than the opinions of a very small group of people who were able to understand what was involved.

On receiving Weaver’s questions, Fosdick sent a hand-written response from his Florida retreat. He stated that, personally, his feelings were the same as Weaver’s and had not changed since November. However, their enthusiasm was purely personal, and the foundation’s situation had changed drastically since November. In particular, in December the trustees had decided to limit total annual outlays to \$10,000,000. This figure was below the average for several years previous, and in fact, over \$16,000,000 had been spent two years earlier. He said that the foundation had about \$1,500,000 to play with, but that the apportionment of this sum had to be planned in relation to the “extra – curricular activities” of the five divisions, including any demands that the war in Europe might make on the foundation. Fosdick did not refer to Weaver’s question regarding appropriating funds from the foundation’s capital.

In response to this letter, Weaver again wrote to Fosdick on January 30, repeating his conviction that the RF should make the fullest possible use of the opportunity presented by Lawrence’s cyclotron project. He also said that he had not been fully aware of the changes in the Foundation’s internal circumstances that Fosdick explained in his letter. In particular, he had been told nothing about the capital items of divisions other than his own, and had been totally unable to foresee that expenditure limitations would

affect the cyclotron project.

At this juncture, Weaver clearly understood the changes in the foundation's circumstances that Fosdick had explained, and conceivably he may have given up on submitting the cyclotron project to the April meeting of trustees for this reason. Weaver, however, also had another reason for not presenting the project in April: He planned to set sail for Europe on February 10 and would be away until the time of the meeting, leaving him no time to prepare for it.

Uninformed of the details of the Foundation's internal circumstances, Lawrence, as might be expected, was set on having the plan submitted at the April meeting. On January 29, Weaver received a call from Lawrence, who said that he realized that getting the project accepted as it stood would be impossible. He proposed reducing the size of the cyclotron from 184 inches to 150, which would cut costs from \$1,500,000 to \$750,000, and requested a grant of \$500,000 from the RF. Weaver sternly pointed out that scaling down the project in this way would probably undermine the justification for even a \$500,000 RF grant. He also declared that delaying the project would not reduce the opportunities for support.

Weaver, unable to understand what prompted Lawrence to rush his project this way, judged that Lawrence was not being dispassionate about it. Indeed, Lawrence may have been "impatient" due to America's being on the brink of war. He reasoned that if the war were lengthy, nobody would be happy to talk about spending enormous amounts on a giant cyclotron, and if it were short, people's concern would be focused on postwar reconstruction and interest in the cyclotron would decline. Because of this, he desired a prompt decision to support the cyclotron, even if this meant reducing its size. On the other hand, Weaver had cautioned that reducing the size would undermine justification for support.

Ultimately, both Lawrence (Feb. 7) and Sproul (Feb. 8) wrote to Weaver indicating that they had given up on submitting the project to the April trustees meeting.

Concrete Steps toward Obtaining Support

An unforeseen turn of events restarted activity to submit Lawrence's cyclotron project to the April meeting: Weaver's trip to Europe was cancelled, and he suddenly found himself with time that could be used effectively to prepare for the meeting. As the preceding discussion shows, Weaver's enthusiasm for the project had not, in fact, waned. Because the project was so large and the expenses involved so great, he felt that it was a good grant-making opportunity for the foundation that he very much wanted to see materialize. The question was how to overcome the foundation's internal difficulties.

Weaver's moves to get the project supported began in earnest with another meeting with Fosdick. Subsequently, at Fosdick's suggestion, Weaver met informally with the trustees in scientific fields. These informal meetings must have had great significance with respect to ascertaining individual trustees' opinions of the plan and, consequently, to obtaining supporters at the April meeting. Only after going through this process did Weaver decide to submit Lawrence's project to the April meeting of trustees. During this time, of course, he was in close communication with Lawrence at Berkeley, giving further consideration to the details of the huge cyclotron's size, costs, and purpose.

February 8, meeting with Fosdick : Weaver's diary records that he met with Fosdick on February 8 and presented him with three questions that indicate Weaver's continuing enthusiasm for the cyclotron project. Two of the questions related to the query made in his earlier letter to Fosdick about appropriating RF capital funds for the grant. Firstly, if submission of the plan were put off for a year, would there be any way to put up \$200,000 from the 1940 Natural Sciences Division budget and the same amount again from the 1941 budget? Secondly, in that case, what would be the maximum amount from capital that could be expended to cover the \$400,000? Thirdly, if the plan were submitted in 1940, he was considering allocating it a maximum of \$250,000 from the Natural Sciences Division budget; what would be the maximum amount from capital that the Trustees would consider to make up for this? Fosdick's reply indicated that the first would be possible if arrangements were made in budget items; the diary does not reveal Fosdick's response to the second and third questions.

At this meeting, the two agreed that the plan should not be scaled down without good reason. Weaver, in particular, indicated that he felt the \$1,500,000 figure for the program's main expenses could not be significantly reduced without damaging its essential features. For that very reason, he felt that it would be necessary for the RF to award it a grant of \$750,000 to \$1,000,000, and that if Lawrence were assured of this support, he would be able to get further funds from other sources. Fosdick promised to consider Weaver's questions and suggested that Weaver meet directly with other scientific trustees to let them know that the giant cyclotron project existed so that they could form their own opinions.

This seems to indicate that supporting the cyclotron project to the extent that Weaver desired would be difficult using only Natural Science Division funds, meaning that foundation capital would have to be used. Fosdick's advice seems to mean that Weaver should convince the trustees who would be making the decisions on capital outlays. With this meeting, Weaver launched full-scale action to have the grant approved.

With this change in circumstances, Weaver immediately telegraphed Lawrence on February 9, informing him that he was planning to hold meetings about the cyclotron project in the near future. In a letter to Lawrence on February 13, Weaver mentioned a number of informal meetings with several key people, indicating that he had gone into action. At this point, however, Weaver told Lawrence only that time would be needed for these meetings, avoiding mention of the April meeting of trustees.

February 9, meeting with L.A. DuBridge, University of Rochester : Weaver's diary indicates that he visited the University of Rochester on February 9. Pathologist George H. Whipple, a foundation trustee, was on the university faculty, but the diary mentions only a meeting with L.A. DuBridge. DuBridge considered Lawrence's cyclotron project entirely reasonable. Interestingly, Rochester also had its own cyclotron, which was producing radioactive isotopes but was facing financial difficulties with respect to pure physics research. DuBridge told Weaver that, in the past, the university had received financial support in this field from Research Corporation, but after the death of one of the corporation's trustees who had been particularly interested in Rochester, the university's applications had for some reason been rejected. DuBridge said that at the time he had turned down an offer for the post of research

director at Westinghouse, the university had given him a special research budget of \$14,000. He had been drawing on this money at the rate of \$2,000 to \$3,000 a year, but it would be exhausted in two or three more years.

At the same time the University of Rochester faced this situation with respect to pure physics research, its Radiological Institute had drawn up a huge \$10,000,000 research plan that included constructing a 60-inch cyclotron. If it did not expect to be able to get any financial support, this plan would probably not have been made. In short, there was a clear discrepancy in research conditions between radiology and pure physics. Whether this discrepancy was peculiar to Rochester or was the general situation throughout the United States at this time is a question for future research, although the latter seems more probable.

February 9, meeting with Karl Compton, M.I.T. : Also on February 9, Weaver visited Massachusetts Institute of Technology, where he held a meeting with President Karl Compton and another professor. As mentioned earlier, Compton had become an RF trustee the preceding April. The discussion at this meeting did not bear directly on Lawrence's cyclotron project, but dealt with research personnel in the fields of biological engineering, biological chemistry, and electro-physiology at M.I.T. Weaver gave the names of specific scientists he knew who could be considered. The record of this meeting seems to indicate that the RF did not simply award financial support to research laboratories that had their own research plans, but also played a role in sending them the necessary personnel.

Compton's evaluation of Lawrence's cyclotron project is revealed in a letter he wrote on January 29 in response to Weaver's questions. Compton replied that he considered Lawrence's cyclotron project to be one of the most interesting, potentially most important, and most promising projects in all the sciences at the time. Not stopping at this, he ranked it top among all the various science projects he then knew of, far above the next in line.

Compton elaborated on three points. First, if the RF was going to support a cyclotron project somewhere, no one could take issue with the choice of Lawrence's project at the University of California. Second, if the RF were going to support a large cyclotron, a grant sufficient to construct a cyclotron with enough energy to produce mesotrons, probably 160MeV or a bit more, would be desirable. Third, a giant cyclotron would be useful in many ways, including as a means to study the atomic structure of chemical atoms and to produce radium, a source of radioactive chemical atoms, which could be used in biology, medicine, and medical treatment. For the production of radium, in particular, the larger the cyclotron the more economically it could produce radioactive chemical atoms, so the construction of the huge cyclotron would be justified, even if purely scientific research on the structure of atoms were ignored.

In this letter, Compton said that he had spent the previous week at Alfred Loomis's South Carolina island, where the two of them had considered Lawrence's cyclotron plan. They had felt that there would be no insurmountable difficulties encountered in building the cyclotron, and even if problems arose, Lawrence would be able to come up with various alternatives to overcome them. He confessed that the two of them were absorbed in the potentials of Lawrence's proposed giant cyclotron. Compton concluded by saying that he was clearly not disinterested, but that his interest was completely

impersonal and had nothing to do with M.I.T., and that it was based on his own enthusiasm for the giant cyclotron project and his faith in Lawrence.

Weaver's visit to M.I.T. on February 9 may have had no direct relation to the cyclotron project, as he had already obtained Compton's opinion. Whether Compton and Loomis shared Weaver's enthusiasm or Weaver shared theirs, all three clearly were exceptionally avid advocates of the plan.

February 10, meeting with Alfred N. Richards, University of Pennsylvania : The next day, Saturday, February 10, Weaver met with another RF trustee, pharmacologist Alfred N. Richards, at the University of Pennsylvania. Richards and his associates were to receive a private contribution for radiological research and were trying to decide whether to construct high-voltage X-ray equipment or build a cyclotron. Weaver told him about a similar problem at Washington University in St. Louis and also gave him general knowledge of other universities and laboratories that already had such equipment for biological and medical research.

Weaver talked about Lawrence's cyclotron plan, and his diary indicates that Richards was interested in it, agreeing that it was an important and characteristic opportunity for foundation support. Weaver gave the \$1,500,000 figure for major expenses, adding that after completion, the University of California could be expected to provide \$86,000 annually for operating expenses. He explained that Lawrence and his associates were seeking other possible sources of funding, but that the project would probably not succeed unless the RF provided most of the support. Richards fervently agreed that the project should not be scaled down.

Interestingly, Weaver gave Richards some other people's comments, presumably those of Compton and others discussed above. Richards immediately pointed out to him that only a very small group of people were able to understand the project and possessed the insight and imagination to recognize its value. Viewed objectively, this was probably true. It is highly unlikely that pharmacologist Richards had the advanced knowledge to argue with the fervent presentation by the foundation's science director. In his diary, Weaver wrote that his clear impression from this meeting was that Richards would support any proposal that would lead to the materialization of the giant cyclotron.

February 15, meeting with Dave H. Morris and H.A. Poillon : On February 15, Dave H. Morris and H.A. Poillon of Research Corporation called at the foundation office for a meeting with Fosdick and Weaver, whose enthusiasm had occasioned the get-together.

On the same day, Weaver wrote to Lawrence raising questions that resulted from the meeting. In short, nobody wanted to have a cyclotron constructed that had a size and characteristics that within a few years might turn out to have been a serious and uncorrectable mistake. In reality, Weaver asked, would it be possible to design a cyclotron that, after completion, could be expanded economically and efficiently to the size and characteristics of the desired 184-inch machine? If so, what would be the approximate minimum cost of building and housing it? Given that Lawrence was probably estimating \$750,000 for a 150-inch cyclotron, what changes would be made in the design, Weaver asked, if the budget were \$1,000,000 or \$1,125,000? Note should be made that "economically and efficiently" meant that the total

cost of initial construction plus the expenses necessary for later expansion would not differ too greatly from what it would cost to build it on a large scale from the start.

Weaver's diary entry for the day notes that Morris was completely behind Lawrence and had clearly stated that he would do everything he could for the project. Morris also said that even if a large contribution were impossible, an appropriate amount would probably be granted for three years, and that he would be happy to act as a go-between in obtaining further support from other foundations. This stance on the part of Research Corporation personnel clearly gave Weaver a boost. He wanted the foundation to allot capital funds to the giant cyclotron project, even if it meant making the rounds to convince other trustees. At this point, however, a specific figure had not been set. The size of a grant clearly related to the purpose in constructing the cyclotron, e.g. to the RF's objectives in supporting it, and he seems to have been unable to obtain a clearer figure.

In his February 13 letter to Lawrence, Weaver requested Lawrence's best estimate of about how much energy particles would have to be given to produce mesotrons, an important issue. In his reply on February 20, Lawrence gave several estimated costs: plan A, \$1,500,000 for a full 184-inch cyclotron setup; plan B, \$1,000,000 for a 184-inch cyclotron with a portion cut back; plan C, \$874,000 for a skeleton 184-inch; plan D, \$750,000 for a 150-inch machine. He felt that plan A would reach the upper limit of energy obtainable with cyclotron acceleration and that plan B would probably produce 100MeV deuterons. Plan C probably could not produce 100MeV deuterons but should reach 75MeV. Lawrence said that plan D might be able to produce 100MeV deuterons if the electric supply were increased, but pointed out that once it was constructed, this cyclotron could not be expanded to 184 inches.

Given this, Lawrence said that of course there would be no problem with plan A, but if any of the others were to be considered, he hoped that attention would be focused on plan B. In other words, he was probably aiming to produce 100MeV deuterons. Lawrence said that he would write again the next day regarding mesotron mass and the particle energy necessary for producing mesotrons, but that he had discussed the matter with Enrico Fermi and Robert Oppenheimer that afternoon (Feb. 20), and they had agreed that mesotron mass would be between 70MV and 120MV, with the most probable figure being around 80MV. Confirming this figure in his letter the following day, Lawrence said that given present knowledge, it was impossible to answer the question of the particle energy needed to produce mesotrons, but that, at the least, greater energy than the mass of the mesotrons would be needed and that the probability of successful mesotron production would increase the higher the particle energy used.

February 20, meeting with George H. Whipple, University of Rochester : Weaver's diary indicates that on February 20 he again visited the University of Rochester, where he met with George H. Whipple, dean of the School of Medicine and Dentistry and a trustee of the Rockefeller Foundation, to tell him about Lawrence's cyclotron project. Weaver briefly explained that there was ample scientific basis for going through with the project, gave him the opinions of other specialists, and outlined the project's scientific implications.

Regarding expenditures to support it, Weaver said that if the RF granted the project \$1,500,000, it

would support all the major expenses for the enormous machine and promote the advancement of science, gaining great satisfaction as a donor; if the foundation awarded it \$1,250,000, the University of California should be able to get most, if not all, of the remaining \$250,000 from other foundations; if Rockefeller gave it \$1,000,000, a 184-inch cyclotron would probably be constructed but would start off without some of the necessary equipment, and the University of California would probably make up for this by obtaining additional funds from other sources; if Rockefeller provided only \$750,000, the university would have to get \$300,000 in additional funds.

Weaver's explanation to Whipple differed somewhat from what Lawrence had indicated in the February 20 letter. Lawrence had considered building even a 150-inch cyclotron at a cost of \$750,000, but Weaver's explanation allowed only for the 184-inch machine, which would cost over \$1,000,000 even if it were only a skeleton. This is an important indication of Weaver's conviction that scaling down the cyclotron would undermine the justification for support. Weaver straightforwardly told Whipple that he would like to know the degree to which the technically trained trustees, such as Whipple, would consider support for the project justifiable.

Before answering this question, Whipple told Weaver about his experiences with the trustees' lack of enthusiasm for planning and deciding the foundation's general support programs. This was a very important and interesting question. He took issue with officers who, like Weaver, drew up a support plan ahead of time and presented it to the trustees before the formal meeting to find out their intentions because there were some among them who announced that they would resign if the trustees refused their proposals. This indicates that the trustees' approval did not reflect consideration of a plan per se, but rather, reflected their faith in the individual officer who submitted it. Whipple argued that this forced the trustees into the ridiculous position of doing nothing more than rubber-stamping a proposal. Weaver's diary says that he wanted to counter this argument, but did not.

Whipple agreed that Weaver's proposal for the giant cyclotron project was of maximum interest and importance and stated that Weaver should submit alternative plans to the meeting rather than narrowing the proposal down to just one. In other words, he wanted it fully discussed at the meeting of trustees. He stated that he did not want to express his views in this informal meeting, and depending on the debate at the trustees' meeting, might change them. In his diary, Weaver made the hopeful observation that although Whipple refused the request to declare his opinion of the project at the trustees' meeting, he would probably support the proposal to grant the project the full \$1,500,000.

After these informal meetings with scientific trustees, Weaver seems to have determined to submit Lawrence's cyclotron proposal to the April meeting. In a night letter on February 27, he informed Lawrence that he would present a proposal containing the alternatives of \$750,000 and \$1,000,000 to the April meeting, adding that he would do everything possible to get the higher figure. He said that he wanted to be able to guarantee that the university would provide at least \$250,000 so that the project to build a 184-inch machine could go ahead regardless of which figure was granted. He also wanted to be able to guarantee that the university would agree to pay operating expenses for at least 10 years after completion. At this juncture he was reconfirming the university's intentions regarding the prerequisites for the grant.

Thus Lawrence's plan for a giant cyclotron came to be submitted to the April 3 meeting of trustees. Future research on Weaver's informal meetings with the trustees and the details of the Foundation's internal situation is needed to gain a complete picture of the process through which the decision to support Lawrence's cyclotron was made.

With respect to the proposal for Lawrence's giant cyclotron project, Weaver relied completely on Karl Compton for support. Letters to Compton on March 1 and March 25 reveal Weaver's feelings at the time. At the April 3 meeting of the trustees, Natural Sciences director Weaver would need to deliver a lengthy explanation of his reasons for submitting the proposal, and he entreated Compton to attend by all means. He also sent Compton a copy of the top-secret docket for the meeting, including his own speech explaining the reasons for presentation, hoping that Compton would make some comment at the meeting.

Doubtlessly, Lawrence's supporters, such as Research Corporation, Compton and Loomis, tangibly and intangibly influenced the RF's decision to support the construction of the giant cyclotron. The above discussion, however, seems to shed light on the foundation's grant-making process. That is, the foundation was deeply involved in drawing up the plans from the start, and provided grants for carefully-selected, large-scale, long-range projects in the fields of interest. Regarding the foundation's support, Weaver said that the RF "buys a project," but that it buys desirable projects that it has been closely involved in planning. The giant cyclotron project, for which single-source support was an important issue, seems to be one such case.

Notes:

The documents bearing on the RF's internal circumstances that form the basis for this paper include: the diaries of Warren Weaver, Rockefeller Foundation Director for the Natural Sciences; records of Weaver's correspondence with Ernest O. Lawrence and President Robert G. Sproul of the University of California; records of Weaver's correspondence with other scientists, and other materials, all in the holdings of the Rockefeller Archive Center. At the time of this study (July 12 to August 6, 2004), the most important of these documents, the Weaver diaries, were in the process of microfilming and unavailable for direct perusal. Because of this, only the portion of them in the files bearing on the cyclotron, as well as sections that were made available through the kind offices of Dr. Darwin H. Stapleton, have been used in this paper. The main documents utilized are catalogued in RF1.1, series 205D, boxes 12-13, folders 181-184.