

The Rockefeller Foundation (Non) Policy Toward Physics Research and Education in Latin America

by Adriana Minor García

Centro de Estudios Históricos, El Colegio de México



© 2019 by Adriana Minor García



Abstract

This report provides an overview of the history of physics in Latin America through the intervention of the Rockefeller Foundation. It is mainly based on reports and correspondence located at the Rockefeller Archive Center, documenting the interaction of Rockefeller Foundation officers with Latin American physicists, providing insight into how these scientists represented themselves. It focuses on the policies of the Rockefeller Foundation behind its support for physics communities and institutions in Latin America from the 1940s to the 1960s. It provides a panoramic – but not exhaustive – view about how these orientations changed according to the group, the topic, and the geopolitical context.

Introduction

An inspiring corpus of works about the role of the Rockefeller Foundation (RF) in Latin America exists nowadays. Among such works, the book edited by Marcos Cueto in the 1990s, *Missionaries of Science*, is still one of the most representative, with a remarkable focus on medicine and agriculture. These areas were in fact the priority of the RF for decades in Latin America. However, other scientific disciplines were also supported by the foundation, such as physics and mathematics. For sure, the funds provided and the consistency of the institutional agenda for these areas were not as impressive as in the case of medicine and agriculture, but as this report demonstrates, they had, nonetheless, important impacts for this region.

I am particularly interested in the role of the RF in the promotion of cosmic ray physics. As my current research demonstrates, this field was particularly important for the development of physics research in Latin America at least until the first half of the 20th century, but with visible effects still today. The opportunity to conduct research at the Rockefeller Archive Center reveals that the RF found in cosmic ray physics a promising field for supporting physics in Latin America, especially in Brazil, Mexico, and Uruguay, that would be profitable for its agenda. The documents I have reviewed for this purpose also offer a broader view of the RF's support for physics in Latin America, including when it started, who were the interlocutors, what were the expectations, as well as the orientations.

The Rockefeller Foundation did not have a special interest in physics research (even less in physics education) and funds in this area were supported only in exceptional cases, as it was emphasized repeatedly in correspondence to Latin American physicists. In fact, the policy was that in the RF would not have program for physics per se in Latin America. Even though, as I show in this report, the range of initiatives in physics supported by RF was still relevant. In this framework, it is still interesting to figure out how such a “non-existing program” was configured and adapted to what RF officials understand as exceptional in specific contexts. This report is an attempt to elucidate the main characteristics

and approaches of the Rockefeller Foundation (non) policy for physics in Latin America.

Preparations

In 1927, Argentinian physicist Ramón Enrique Gaviola requested a fellowship from the International Education Board (IEB), in order to conduct research at Johns Hopkins University. His application opened the discussion about what to do with applications from Latin American scholars. Gaviola had received a PhD in physics at the University of Berlin, and by the time of this request, he was a research associate there. IEB's officers, such as Augustus Trowbridge and Wickliffe Rose, expressed that even though Gaviola's application was a good case because of his scientific credentials and letters of support (one of which was sent by Albert Einstein), they needed directions from the IEB's Executive Committee with regard to candidates from Latin America, since the IEB had no precedents. It is important to mention that the IEB had an important role for improving physics research in the United States through its fellowship program that allowed US physicists to travel to the main physics centers in Europe. Also, the IEB provided fellowships to European physicists to travel to other countries on the continent and to the United States. In the end, Gaviola's application was treated as a European one, which justified its acceptance.

Notwithstanding, Gaviola's inquiry opened an interest in possible Latin American candidates, as well as on potential developments in physics in Latin America, at least with regard to information that Gaviola could provide regarding Argentina, when he was interviewed by IEB's officers. Even Rose expressed his pleasant surprise about knowing for the first time that there were scientific institutions and physics research to take into consideration in Latin America. The IEB effectively merged with the RF in 1928, and as such, it was not through the IEB, but the Division of Natural Sciences that by 1941, the Rockefeller Foundation started an effort to support physics research in Latin America. As part of this, the Observatorio Astronómico of Córdoba in Argentina, which by then was directed

by Gaviola, obtained that year an RF grant-in-aid to support a technical assistant for the development of a research program in astrophysics.

The fact that Gaviola had been an IEB fellow was taken into consideration in awarding this grant, in addition to the recommendation provided by Harry Miller, who was one of the main interlocutors who linked the Rockefeller Foundation with Latin American physics communities and research institutions. Miller's agency had started to build-up when he traveled to Latin America in 1941, commissioned by Warren Weaver, head of the Division of Natural Sciences, to establish contacts and identify fields of knowledge that would allow an expansion of the presence of the Rockefeller Foundation in the region. This visit was the starting point for the RFs' support for the "basic sciences" in Latin America.

After his visit in 1941, Harry Miller recommended funds (regarding physics research) for Alfredo Baños in Mexico, Gleb Wataghin in Brazil, and Walter Hill in Uruguay, in addition to funds for Gaviola's observatory. Early on, Miller was responsible for the identification of "exceptional" scientists that could deserve RF support. Although his recommendations were important for assigning grants, the authority to accept an application for a fellowship or funds for research was not only on him. The applications were distributed to a committee that evaluated proposals, but also to US scientists who expressed their opinions about them, along with Latin American scientists, who became a kind of advisory group, once they had received grants by the Rockefeller Foundation or other US institutions. In addition, Miller acted in accordance with the RF general policy, for example, regarding the emphasis on having appropriate infrastructure, the promotion of full-time positions for scientists, and the search of local funding for scientific research as conditions for granting RF funds.

Exceptionalisms

At the time of Miller's visit to Brazil in 1941, a symposium on cosmic ray research was taking place in Rio de Janeiro. Gleb Wataghin and other Brazilian physicists organized this meeting with the support of the Brazilian Academy of Sciences.

They were taking advantage of the fact that the US Nobel physicist Arthur Compton was visiting Brazil as part of a combined scientific expedition and diplomatic mission in Latin America. In this context, Miller had the opportunity to exchange impressions with Compton, who strongly recommended support for Wataghin. Miller transmitted to RF officers Compton's opinion and added that Wataghin and his group were one of the most promising for physics research in Latin America, particularly notable for their activity in cosmic ray physics. As a result, the foundation decided to award funds to this group, with the understanding that if Wataghin stopped leading it, then the grant needed to be reconsidered. The scientific excellence showed by this group, especially its leader, Wataghin, was the main justification for this support.

Wataghin, an Italian-Russian physicist, had arrived to Brazil in 1934, when he accepted a position to direct the recently created Departamento de Física at the new Universidade de São Paulo (USP). He made a great effort to establish a research tradition at USP, focusing on the study of cosmic rays. At the beginning, Wataghin encouraged his students to continue their training in physics research in Europe, but because of the war and also with new links, such as those with RF, his team increasingly strengthened ties with the US. Prior to Miller's visit to Latin America, Wataghin had traveled to the US in the summer of 1940, where he was introduced to Warren Weaver by Nicolas Rashevsky, a Ukrainian mathematical biophysicist working at the Department of Physiology of the University of Chicago. This visit probably was also Wataghin's first personal contact with Compton. As a result of this contact, one of Wataghin's first physics students at USP, Paulus Pompeia, decided to go to the University of Chicago to work with Compton. The presence of Pompeia also acted in favor of organizing Compton's scientific expedition in 1941 to Brazil, as well as to Peru and Argentina. The visit was an excellent opportunity for Wataghin and his students to show the kind of research work they were doing. It also allowed them to demonstrate their capacities as researchers, since they collaborated with Compton in conducting experiments in Brazil, putting to use their own experience in taking measurements of cosmic rays with balloons.

Funds provided by RF were mainly for supporting research work on cosmic rays, allowing Wataghin's group to buy instruments, to fund travels, to get

subscriptions to scientific journals, and to acquire books. As in other cases, World War II altered the work Wataghin was doing, as well as the work of his students, such as Marcello Damy de Souza Santos (who previously had a visiting research appointment at the Cavendish Laboratory at Cambridge University in the UK). Researchers were now being diverted from their standard research to collaboration with the war effort. Wataghin was not incorporated into these activities because of his Italian nationality. In this context, and having difficulties importing equipment, he continued his research work with a young student, Oscar Sala. Also, Compton, in spite of his enthusiasm about Brazilian physicists and his desire to maintain collaboration with this group, had to leave aside his cosmic ray research work to act as director of a special division at the University of Chicago, in charge of the construction of Enrico Fermi's atomic pile. (As a side note, Fermi had convinced Wataghin to accept the offer to go to Brazil in 1934, when both were still based in Italy).

By the end of WWII, in an attempt to reconfigure research at USP's Department of Physics, Wataghin requested to assign funds from his RF grant to travel to the US in 1945, accompanied by Santos. During this trip, for which the itinerary was negotiated with Miller, Wataghin and Santos visited different universities and research institutions, but particularly the University of Illinois, where Donald Kerst was conducting research. Santos remained for more than a half a year in the US, and negotiated the acquisition of a betatron, a particle accelerator, designed by Kerst. This accelerator was bought for USP with RF funds. Miller supported this proposal by emphasizing Santos' skills as an experimental physicist. He even said that Santos was "the white hope of physics in Brazil", and that he did not know anyone else in Latin America like him, in terms of his scientific excellence (except for the Mexican physicist Manuel Sandoval Vallarta). Again, the identification of exceptional scientists acted in favor of this application.

The acquisition of this accelerator marked a re-orientation of Wataghin's group that changed its focus on cosmic rays for experimental nuclear physics. In that line, Sala was commissioned, also with RF funds, to go to Illinois and work on research techniques with the betatron. These funds were justified by Miller also by emphasizing Sala's abilities as an experimentalist, saying that he was "a second Santos". In fact, Sala changed his plans while in the US, and was commissioned

to go to the University of Wisconsin to learn how to build a Van de Graaff accelerator with Raymond Herb.

Analogous to these Brazilian examples, there were other exceptional Latin American physicists who had Rockefeller Foundation support for equipment acquisition or fellowships for training in the US. In some instances, fellowships were destined to promote exchanges among Latin American physics communities. One example is Uruguayan physicist Walter Hill who went to Brazil to Wataghin's group in 1947, as suggested and managed by Miller. Hill's original plan, presented in 1941, was to go to the US to work with Sandoval Vallarta, a Mexican physicist who was professor at the Massachusetts Institute of Technology (MIT).

Institutions and Infrastructure

In 1941, Miller reported that the most remarkable scientific institutes in Mexico were those of physics, mathematics and biology at the Universidad Nacional Autónoma de México (UNAM). Alfredo Baños was the director of the Instituto de Física, created in 1938, which was the first institution in Mexico for research in that discipline. The creation of the Instituto de Física coincided with Baños' return to Mexico, after he completed his PhD in physics with a Guggenheim fellowship to study at MIT, under the supervision of Sandoval Vallarta. This was not by chance, but a plan encouraged by Sandoval Vallarta himself and other UNAM professors who were committed to the promotion of scientific research in Mexico. In this regard, Arthur Compton was also an important ally, following his first scientific expedition to Latin America in 1932, which included cosmic ray measurements in Mexico. Through this expedition, Sandoval Vallarta was involved in Compton's research program in cosmic ray physics, becoming a specialist in this field. Sandoval Vallarta encouraged Mexican engineers, such as Baños, to go with him to MIT to be trained in cosmic ray research. In this manner, he played a special role in establishing scientific relations between Mexico and the United States. Baños' RF application in 1941 meant another way to strengthen those links.

Funds provided with Miller's recommendation were earmarked for UNAM for the purpose of establishing a laboratory for precision electrical measurements with equipment supplied from the United States. In addition, another grant for the Instituto de Física was launched by the presence of a Spanish physicist, Blas Cabrera. He had been one of the recipients of funding provided by the IEB for building the Instituto de Ciencias Físicas y Químicas, located in Madrid. As a result of the Spanish Civil War, Cabrera was forced into exile, arriving to Mexico in 1941 through mediation of El Colegio de México (previously, Casa España). RF funds would serve to provide Cabrera with material conditions to establish workshops where he could train Mexican students in the design and construction of scientific instruments, work he could do in spite of being afflicted by Parkinson's disease and old age. But this time, the foundation requested various conditions from UNAM in exchange: a permanent salary for Cabrera, as well as for his laboratory assistants, and a building for installing laboratories and conducting workshops.

Since its founding, UNAM's Instituto de Física had been provisionally located in a room of the Escuela Nacional de Ingeniería, a space that obviously was not enough to install laboratories and workshops. Baños tried to solve this situation in different ways, but the option that he found doable was through collaboration with the Mexican Army, which would share part of a building with the Instituto de Física. For Baños, this was a convenient solution, so he announced it proudly to Miller in 1942. However, Baños' plans were not executed due to disagreements with other important UNAM academic figures. They were concerned that scientific research with military implications would involve an association with the Mexican Army in the context of the World War II. This opposition along with an accusation of plagiarism forced Baños' resignation as director of the Instituto de Física. As a result, plans to move to appropriate facilities were stopped and research activities at the Instituto de Física slowed down. Then, Sandoval Vallarta was named director, since he had come back to Mexico that same year. Equipment acquired with RF funds was not installed, and the Instituto de Física had no further support from the foundation until the 1950s, when UNAM's university city was erected and the institute finally had a special building.

A similar conflict involving facilities appeared in the case of Brazil in the 1940s when RF approved to fund the acquisition of the betatron. Miller insisted on an agreement with the local government and USP authorities that would require the construction of an appropriate building for the installation of the betatron, as well as the assignation of local funds for research with this instrument. Negotiations were complicated, and Miller had to ask constantly for information about developments in this regard. In addition, USP authorities wanted that the funds donated to Wataghin's Departamento de Física be centralized and managed by the university. Then, Miller had to be clear about RF policy to support remarkable scientists rather than institutions. As in the case of UNAM's Instituto de Física, by the late 1940s plans of a university city for USP allowed the Departamento de Física to have special buildings for the installation of accelerators and other locations for physics research. In both cases, infrastructure was a determining element in order to maintain RF support, which balanced its policies on promoting institutions or exceptional scientific careers.

Postwar Anxieties

For acquisition of the betatron, permission was required from the US Atomic Energy Commission. This negotiation was conducted by the RF, since the purchase of the accelerator involved its funds. In the exchanges with the AEC, another RF policy regarding physics was made clear. While RF denied that its activities included a specific program in pure physics, according to the AEC, US institutions such as the RF should avoid supporting nuclear physics research in Latin America. In spite of this, they both agreed that a small grant in this case was not against this policy.

The Rockefeller Foundation's intention was to act in concert with other US agencies, trying to avoid overlaps and conflicts. In this regard, political activities of Latin American physicists sometimes were a matter of concern for the foundation. One example is the case of Andrea Leviardi, the technical assistant contracted for the Observatorio Astronómico of Córdoba with an RF grant, who was fired from his job because of disagreements with Gaviola, after he attended

an anti-fascist meeting in Uruguay in 1942. Wataghin was also a subject of investigation because of political reasons, since he was Italian. Especially after WWII, some researchers were suspected of communist sympathies by the US and local government, a matter that affected the whole group of USP physicists. Miller even expressed his conviction that there was not a communist in this group, except for Mario Schönberg, a theoretical physicist and Wataghin's student who had been a Guggenheim Foundation fellow, and by 1946, local deputy of the Brazilian Communist Party. This whole situation contributed to a cooling of relations with the Rockefeller Foundation, and as a result RF support for physics in Brazil became even rarer.

Oscar Sala was an exception. He had built a Van de Graaff accelerator for USP that started to function in 1954, but he had no funds to establish a research program in experimental nuclear physics, as was his ambition. He applied for funds and Raymond Herb, with whom Sala collaborated with an RF fellowship in 1948, sent a letter of support, stating that Sala was the most exceptionally talented experimental physicist he knew. Accordingly, the foundation decided to support his research program in 1959, not without emphasizing that physics research had not been among its priorities, and even less so, this specific field of experimental nuclear physics. It was also recommended to consider other application options to the Ford Foundation or the Inter-American Development Bank, which had a clearer interest in that discipline than the RF did. With the RF's support (that allowed also Sala to stay in Brazil since he had received job offers in the US), he was able to constitute a research group in experimental nuclear physics and maintain collaboration with Herb's group. When Sala was finally appointed to a chair in nuclear physics at USP in 1962, he announced it enthusiastically to Miller, saying how satisfied he was with the achievements of his research group and recognizing that their success was also a result of the RF's and Miller's support.

The Rockefeller Foundation's restriction on certain fields is also evident in the case of Mexico in the 1950s. Alberto Sandoval, the director of the UNAM's Instituto de Química, suggested to Miller that the Instituto de Física would like to request a grant, avoiding issues related to atomic energy. The Director of the Instituto de Física, Carlos Graef (who had also received a PhD from MIT under Sandoval Vallarta's supervision) reestablished contact with Miller with the intent

of exploring these possibilities. Graef complained that Mexican physicists had thought that the Rockefeller Foundation had decided not to help anymore the development of physics research in the country, after its initial support in the 1940s. In answer to Graef's statement, Miller remarked again about the standard policy of the Rockefeller Foundation in regard to physics research. He said that this field was supported only in extremely rare occasions, and mostly when research was connected in some way with medicine and agriculture. As such, Graef should not assume that RF was interested in establishing a program in physics. However, as a result of this new contact, in 1956 a grant was provided for research on radiochemistry conducted by Augusto Moreno, who had worked on radiocarbon dating methods with Willard Libby at the University of Chicago. In fact, Miller solicited Libby's opinion, who said that he had to be sure that Moreno would make good use of funds, more than any other UNAM professors. Connecting with radioisotopes, in the 1960s the Rockefeller Foundation also provided a fellowship to Ma. del Carmen Cassano Cuadros, from Perú, and gave funds for the Institute of Physics of the University of Chile to acquire cesium. This shows a shift in funding policy by the RF.

Physics Education

Another field of interest in RF's approach to physics in Latin America was directed to teaching. In 1951, the Universidad de los Andes in Bogotá, Colombia, requested funds for purchasing instruments for its teaching laboratories in physics. The foundation emphasized at the beginning that its interests were in scientific research, not in education. Nevertheless, having in mind the university's business-like model and that this was something that should be promoted in Latin America (according to RF), the foundation decided to go ahead, even when qualifying this request as rather ridiculous. To assign a small grant would allow the purchase of equipment for expanding their "pathetically small scientific equipment."

In addition to this support, in the 1960s the Rockefeller Foundation implemented in Colombia a reformed curriculum at the Universidad del Valle, in Cali, which

included redesigning the physics course. For this purpose, the RF contracted Dudley Towne, a professor of physics at Amherst College, for teaching a year in Cali. Towne also recommended some of his outstanding students, as candidates for fellowships to go to the US, since, he said there were no physicists in Cali, or even in Colombia, as a whole. It is interesting how this negotiation contributed to the emergence of racial issues since RF was concerned about how these “dark-skinned” fellows would be received at southern universities in the US. This kind of fellowships to study the teaching of physics at Amherst College were also provided in Chile, to Jorge Krause Astorga in 1962. In addition to fellowships, in the case of Cali, the Rockefeller Foundation also provided the university with instruments, books, and movies, those that the Physical Science Study Committee had developed at MIT. In these cases, the RF played a role in implementing models of physics teaching and higher education profiles in Latin America.

Final Remarks

Harry Miller emphasized multiple times that the Rockefeller Foundation did not have a program in physics, nor a policy of significance regarding that discipline. There were only some fellowships awarded from time to time for strengthening physics teaching and research in some universities that particularly interested the foundation, such as USP. On very rare occasions the RF provided some equipment to help fellows to establish research in their countries. In a certain sense, Miller’s vision about what should be the foundation’s support in physics was consistent with the one articulated during his first trip to Latin America in 1941 - maintaining a policy in which funds should be granted only in exceptional cases, but not as either a long-term or a broad program. Sometimes the RF’s emphasis was on promising scientists, or on institutions and research groups, other times on topics, for example, by promoting cosmic rays but excluding nuclear or atomic physics, but emphasizing intersections of physics with medicine and agriculture. Even when RF officers, such as Miller, tried to emphasize that there was no such a thing as a real RF policy for physics in Latin America, it is still possible to identify orientations, sometimes contradictory, but nonetheless adapted to the context, the group, and the changing interests of the institution.

Archival Sources – Rockefeller Archive Center

International Education Board records (FA062), accession No. 26, series 1: Appropriations, subseries 3: Fellowships in Science, box 49, folder 743: Ramón Gaviola, 1927-1929.

International Education Board records (FA062), accession No. 26, series 1: Appropriations, subseries 2: Foreign countries, box 41, folder 579: Spain 1 – Institute of Physics and Chemistry, 1926.

International Education Board records (FA062), accession No. 26, series 1: Appropriations, subseries 2: Foreign countries, box 41, folder 580: Spain 1 – Institute of Physics and Chemistry, 1927-1928.

International Education Board records (FA062), accession No. 26, series 1: Appropriations, subseries 2: Foreign countries, box 41, folder 581: Spain 1 – Institute of Physics and Chemistry, 1929-1939.

Rockefeller Foundation records, projects, RG 1.1 (FA386b), series 301: Argentina, subseries 301 D: Argentina – Natural Sciences and Agriculture, box 4, folder 48: National Astronomical Observatory, Cordoba (Gaviola, Enrique), 1941.

Rockefeller Foundation records, projects, RG 1.1 (FA386b), series 301: Argentina, subseries 301 D: Argentina – Natural Sciences and Agriculture, box 4, folder 49: National Astronomical Observatory, Cordoba (Gaviola, Enrique), 1942-1943.

Rockefeller Foundation records, projects, RG 1.2 (FA387b), series 305: Brazil, subseries 305 D: Brazil – Natural Sciences and Agriculture, box 48, folder 17: University of Sao Paulo - Physics (Sala, Oscar), 1957-1963.

Rockefeller Foundation records, fellowships, fellowship files, RG 10.1 (FA244), series 305: Brazil, subseries 305 E: Fellowships, scholarships, training awards, box 92, folder: Sala, Oscar, 1946.

Rockefeller Foundation records, projects, RG 1.1 (FA386b), series 337: Uruguay, subseries 337 D: Uruguay – Natural Sciences and Agriculture, box 4, folder 29: University of Montevideo Physics (Hill, Walter S), 1942-1945.

Rockefeller Foundation records, fellowships, fellowship files, RG 10.1 (FA244), series 331: Peru, subseries 331 E: Fellowships, scholarships, training awards, box 206, folder 3125: Cassano Cuadros, Maria del Carmen, 1964-1967.

Rockefeller Foundation records, projects, RG 1.1 (FA386b), series 323: Mexico, subseries 323 D: Mexico – Natural Sciences and Agriculture, box 17, folder: University of Mexico Physics (Banos, Alfredo) 1941.

Rockefeller Foundation records, projects, RG 1.1 (FA386b), series 323: Mexico, subseries 323 D: Mexico – Natural Sciences and Agriculture, box 17, folder: University of Mexico Physics (Banos, Alfredo) 1942-1945.

Rockefeller Foundation records, projects, RG 1.2 (FA387b), series 323: Mexico, subseries 323 D: Mexico – Natural Sciences and Agriculture, box 51, folder: University of Mexico – Science Institutes - Physics 1956-1961.

Rockefeller Foundation records, fellowships, fellowship files, RG 10.1 (FA244), series 305: Brazil, subseries 305 E: Fellowships, scholarships, training awards, box 97, folder 1747: Wataghin, Gleb, 1947-1948.

Rockefeller Foundation records, projects, RG 1.1 (FA386b), series 305: Brazil, subseries 305 D: Brazil – Natural Sciences and Agriculture, box 13, folder 116: University of Sao Paulo – Physics, 1940-1.

Rockefeller Foundation records, projects, RG 1.1 (FA386b), series 305: Brazil, subseries 305 D: Brazil – Natural Sciences and Agriculture, box 13, folder 117: University of Sao Paulo – Physics, 1942-3.

Rockefeller Foundation records, projects, RG 1.1 (FA386b), series 305: Brazil, subseries 305 D: Brazil – Natural Sciences and Agriculture, box 14, folder 118: University of Sao Paulo – Physics, 1944.

Rockefeller Foundation records, projects, RG 1.1 (FA386b), series 305: Brazil, subseries 305 D: Brazil – Natural Sciences and Agriculture, box 14, folder 119: University of Sao Paulo – Physics, 1945.

Rockefeller Foundation records, projects, RG 1.1 (FA386b), series 305: Brazil, subseries 305 D: Brazil – Natural Sciences and Agriculture, box 14, folder 120: University of Sao Paulo – Physics, 1946.

Rockefeller Foundation records, projects, RG 1.1 (FA386b), series 305: Brazil, subseries 305 D: Brazil – Natural Sciences and Agriculture, box 14, folder 121: University of Sao Paulo – Physics, 1947-1948.

Rockefeller Foundation records, projects, RG 1.1 (FA386b), series 305: Brazil, subseries 305 D: Brazil – Natural Sciences and Agriculture, box 14, folder 122: University of Sao Paulo – Physics, 1949.

Rockefeller Foundation records, projects, RG 1.1 (FA386b), series 305: Brazil, subseries 305 D: Brazil – Natural Sciences and Agriculture, box 14, folder 123: University of Sao Paulo – Physics, 1950-1951.

Rockefeller Foundation records, projects, RG 1.2 (FA387b), series 309: Chile, box 8, folder 51: University of Chile Physics, 1959-1963.

Rockefeller Foundation records, fellowships, fellowship files, RG 10.1 (FA244), series 309: Chile, subseries 309 E: Fellowships, scholarships, training awards, box 112, folder 1938: Krause Astorga, Jorge, 1961-1968.

Rockefeller Foundation records, Secretary's Office, Biographical Files, RG 15 (FA1280), series 4, box 52, folder: Towne, Dudley H.

Rockefeller Foundation records, projects, RG 1.2 (FA387b), series 311: Colombia, subseries 311 D: Colombia – Natural Sciences and Agriculture, box 55, folder 573, University of the Andes, Physics and Chemistry.

Rockefeller Foundation records, projects, RG 1.2 (FA387b), series 311: Colombia, subseries 311 D: Colombia – Natural Sciences and Agriculture, box 54, folder 557: Universidad del Valle, Curriculum Revision, Physics, 1961.

Rockefeller Foundation records, projects, RG 1.2 (FA387b), series 311: Colombia, subseries 311 D: Colombia – Natural Sciences and Agriculture, box 54, folder 557A: Universidad del Valle, Curriculum Revision, Physics, 1962.

Rockefeller Foundation records, projects, RG 1.2 (FA387b), series 311: Colombia, subseries 311 D: Colombia – Natural Sciences and Agriculture, box 54, folder 564: Universidad del Valle, Physics, 1962.

Rockefeller Foundation records, projects, RG 1.2 (FA387b), series 311: Colombia, subseries 311D: Columbia – Natural Sciences and Agriculture, box 54, folder 565: Universidad del Valle, Physics, 1962.