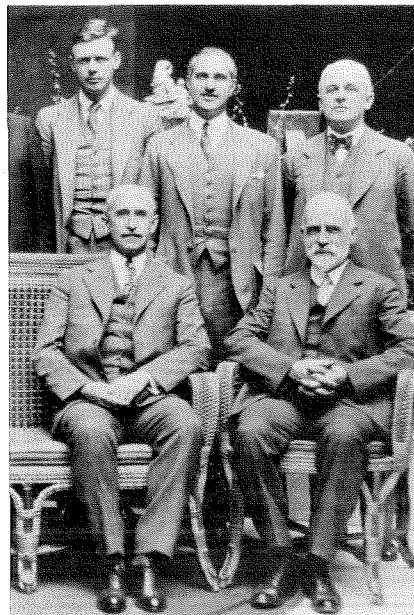


The Triple Alliance

Millikan, Guggenheim, and von Kármán

The 100th anniversary of the birth of Theodore von Kármán will be observed this spring, and one of the ways he will be honored is by a dinner to be held at the Athenaeum on April 21. Von Kármán's is one of the most honored names at Caltech, as it should be. He led aeronautics at the Institute — and the country — to preeminence in the world. How he was lured here in the first place is a tribute to the wisdom and drive of Robert A. Millikan, who was tireless and ingenious in his efforts to recruit a superb faculty for the school he headed. Fortunately, much of the correspondence that led to von Kármán's becoming a part of the Institute survives in the Archives of the Robert A. Millikan Memorial Library. These papers have been organized by the archival staff, in particular Archivist Judith Goodstein, who provided ideas for this article and invaluable guidance through the collections. Some of the letters are on display in the conference room in Kármán Laboratory.



Among the board members of the Daniel Guggenheim Foundation for the Promotion of Aeronautics (ca. 1927) were (seated) Orville Wright, W. F. Durand of Stanford, and (standing) Charles A. Lindbergh, Harry F. Guggenheim, and Robert A. Millikan.

Theodore von Kármán, director of the Guggenheim Aeronautical Laboratory at the California Institute of Technology (GALCIT) from 1930 to 1949, was recognized at the time of his death in 1963 as having contributed more to the fundamental understanding of atmospheric and space flight than any single person in this century. He was also perhaps Robert Millikan's greatest catch, being already distinguished in the infant field of aeronautics (pioneered by his teacher, the mathematical physicist Ludwig Prandtl at the University of Göttingen in Germany) when Millikan lured him here for the first time in 1926.

Born May 11, 1881, von Kármán studied mechanical engineering at the Budapest Royal Technical University and mathematics, physics, and mechanics at Göttingen, receiving his PhD in 1908. He lectured there for three years, waiting for a regular faculty appointment, before finally accepting a post as professor of aeronautics and mechanics at the Technical University of Aachen, which soon became recognized as the foremost school of aeronautics in the world.

Millikan first met von Kármán (according to von Kármán's autobiography *The Wind and Beyond*, written with Lee Edson) sometime in the 1920s, possibly

on the same European trip in 1921 during which Millikan recruited theoretical physicist Paul Epstein at Leiden. But this meeting remained an isolated incident until a few years later when other fortunate circumstances (though Millikan probably had more to do with them than fortune) arose.

The Daniel Guggenheim Fund for the Promotion of Aeronautics was established in January 1926, devoting \$2,500,000 to education and scientific research in aeronautics and to the development and application of aircraft to commerce and industry. Von Kármán states in *The Wind and Beyond* that Millikan read about the fund and its grants to New York University, MIT, and the University of Michigan in the Pasadena *Star-News*. *The Autobiography of Robert A. Millikan* reports that the fund gave subsidies to four institutions in January 1926, but had neglected southern California — an oversight he hastened to correct.

Actually Millikan was even quicker on the trigger than that. On Christmas Eve, 1925, while arrangements for the fund were still being concluded in Washington, Millikan wrote to Harry Guggenheim, Daniel's son, whose interest in aviation had stimulated formation of the fund, proposing establishment of a research center at Caltech to advance the science and art of aeronautics — and an endowment of half a million dollars. On January 6, two weeks before the fund was formally announced, Millikan was meeting with Guggenheim in New York and presenting his arguments — Caltech's outstanding faculty in mathematical physics (Epstein and Richard Tolman), the work already being done here in aeronautics (Harry Bateman and Albert Merrill), the proximity of the Santa Monica airplane plant of Donald Douglas (who had dashed off a supportive letter also on Christmas Eve), and the advantageous climate and

topography of southern California.

At this point, despite von Kármán's and Millikan's versions of the chronology, southern California had not yet been overlooked. Only NYU had received a subsidy for a school of aeronautics, and that was back in June 1925 before the fund itself had been established or even thought of. Millikan, however, was not waiting to give California a chance to be slighted and vigorously pressed his case, tempering it to fit the charitable winds. In a letter to his friend and fellow physicist, Frank Jewett, on January 18, Millikan wrote:

"Unfortunately, Harry Guggenheim has shied away a bit from the word 'research,' and it is possible, too, that the word is over-abundant in my vocabulary. The net result is that his first reaction is not to establish through endowment a real center out here of the kind that is herein proposed, but has asked me to make request to the new foundation for certain installations and for certain assistance for a period of say five years in the way of helpers, apparatus, etc. I am going to do this in a detailed way just as soon as possible. . . ."

"As soon as possible" turned out to be by the end of January, and in an accompanying letter to Harry Guggenheim, Millikan offered to assist him in meeting important people on his fact-finding trip to Europe. Von Kármán's name first came up in this letter of January 29:

"One of our ablest young mathematical physicists is now in Göttingen and might be of much use in connection with the visit to Prandtl's laboratory, while the association of our group with Kármán at Aachen [presumably the Epstein connection] would also open a door which might otherwise remain closed."

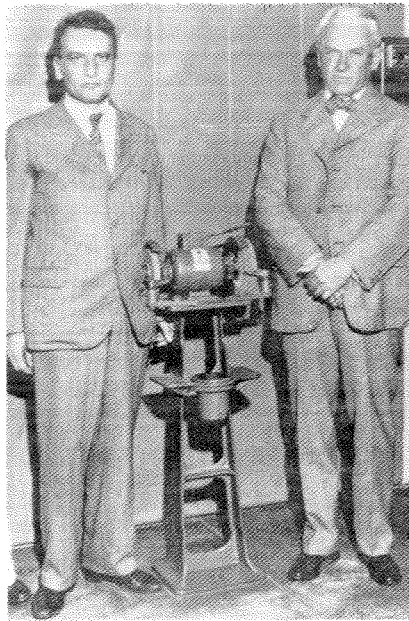
(Apparently Guggenheim did not avail himself of this opportunity. In his autobiography von Kármán recalls being met at the pier in New York on his first visit by Admiral H. I. Cone, vice president of the fund, possibly, it seemed to von Kármán, checking him over to see if he were presentable enough for a visit to the Guggenheims.)

Millikan again traveled to New York on April 30 to talk to Harry Guggenheim and was asked to make a formal proposal to the board of directors. By this time Stanford University was also in the running in the California stakes, but Millikan's confidence remained unshaken. He wrote on May 17 to General J. J. Carty, who had originally leaked the news of the fund to

him way back in December of 1925:

"As a matter of fact, the case is so exceedingly strong for the Institute that I myself can't see how any other claims that may be urged are in any way comparable with those that we are putting forth, but how thoroughly informed the Board is or can be made as to the actual situation, I do not know."

On June 2, 1926, the fund's board of directors met; on June 7 Harry Guggenheim wrote to Millikan that "there was approved in principle an appropriation



Theodore von Kármán and Robert A. Millikan in 1930.

of funds for the establishment of a school of aeronautics at the California Institute of Technology, in accordance with the general purposes of your proposals." He suggested that Millikan submit to the executive committee budget proposals of \$180,000 for building and equipment, \$100,000 for salaries at \$10,000 per year for 10 years, and \$25,000 for 5 years of research at \$5,000 annually. The Caltech and Stanford grants were announced simultaneously, the first two, after NYU, of a total of seven (MIT, the Universities of Michigan and Washington, and Georgia School of Technology).

The Caltech board of trustees met on July 8 to accept this aeronautical program, but Millikan, with characteristic self-assurance, hadn't waited that long to get the ball rolling. A day earlier he had

already written to Guggenheim about his choice of an adviser for the initial construction of GALCIT:

"With respect to the suggestion which you made as I left your house that we try to get Prandtl over here for a short time, I have talked the matter over at length with Epstein and Bateman. Both of them think that in view of Prandtl's advanced age and his somewhat unpractical personality he would be far less useful to us than v. Kármán, head of the aerodynamical laboratories at Aachen, and unquestionably the foremost of the younger aeronautical engineers of Germany; or G. I. Taylor, who occupies a similar position in Great Britain. Bateman and I both know Taylor fairly well personally, and Epstein is well acquainted with v. Kármán (who, by the way, is a Hungarian in nationality). We have between us reached the conclusion, partially because of v. Kármán's nationality and because of his representing in a special way the aeronautical developments on the European continent, that it would be well to try first to see if we cannot get him."

(Apparently Millikan never told von Kármán that he was their first choice; in his autobiography von Kármán assumes that he was asked only because Prandtl was unavailable.)

In addition to not waiting for official approval of the whole program from the Caltech board of trustees, Millikan also did not dawdle around waiting for Guggenheim's reply to his suggestion. Already on July 5, two days before Millikan mentioned von Kármán to Guggenheim, Epstein had written von Kármán at Millikan's direction "to sound out whether you might possibly be inclined to spend a few months with us in Pasadena this fall." In fact, Epstein's letter offers von Kármán Millikan's suggested \$4,000 for the trip and writes that "it is probable, almost certain, that it will be approved."

Millikan does get around to admitting in the July 7 letter to Guggenheim that Epstein has actually already written because there would be a better chance "of getting v. Kármán over here . . . if we can proceed at once than if we delay until after the next school year gets into full swing." He hopes that Guggenheim will not think he has acted precipitously in the matter, and thinks that it will be no problem rearranging things if Guggenheim doesn't fancy the idea:

"In case your Board wishes to get behind the enterprise and prefers Prandtl or

G. I. Taylor, or indeed any one else, let me know and we will simply fit into your plan but cable v. Kármán to the effect that it has been impossible to make the arrangements tentatively suggested in Epstein's letter, and we can then cable or write to Taylor or Prandtl or the other chosen person, whoever he may be, and start the negotiations de novo."

Fortunately for all concerned, Harry Guggenheim was also not the type to worry about such niceties as official approvals and wrote back on July 14:

"I think it a splendid suggestion to try to get Professor v. Kármán to come to America . . . Dr. Prandtl of course stands alone in the aeronautical world, but I heartily agree with you that for a practical visit such as you have in mind and which will fit in very nicely with our plans, Professor v. Kármán is the right man. I do not think for one moment that you acted precipitously; on the contrary, I congratulate you on your initiative."

All this initiative was perhaps not necessary after all. Von Kármán, on vacation in Belgium, was unaware that such impatient forces in Pasadena and New York were shaping his destiny. Epstein's warm (and practical) letter telling him how comfortable visiting German scientists felt in Pasadena and that he could save a nice portion of the \$4,000 since living here wouldn't cost much ("Actually we are paying H. A. Lorentz, who is lecturing here the following trimester, only \$3,500. Of course, he is lecturing in Ithaca till Christmas and is saving a lot that way.") didn't reach him right away. Von Kármán relates in *The Wind and Beyond* that his first inkling of the whole business was a mysterious cable from Millikan forwarded from Aachen:

"Proposals suggested Epstein's letter confirmed. Cable answer giving earliest sailing."

This was dated July 20 after all approvals really had been granted. However, Millikan had apparently forgotten that this was originally supposed to be tentative — his copy of the cable shows that "Arrangements" was written first before being crossed out and "Proposals" substituted.

Von Kármán wrote later in his autobiography that "this odd cable" caught him completely by surprise. "What did he want of me?" Although von Kármán states that he remained in the dark until Epstein's letter arrived 10 days later, he must have found out somewhat sooner

than that what Millikan wanted of him. On July 26 he cabled Millikan from Ostende:

"Accept with thanks. Some difficulty about proposed time. Cable my proposals within a few days."

Von Kármán apparently didn't allow the matter to disturb his vacation, however, and let Millikan stew in his impatience — he was hoping to get von Kármán to Pasadena by August 15. (Millikan to Guggenheim on August 5: ". . . I have been awaiting anxiously another cablegram telling exactly when he will appear, but it has not arrived.")

But on August 14 von Kármán wrote Professor Millikan (with an i handwritten over the e):

"Professor Epstein's letter and your kind telegram have given me great pleasure; the idea of spending some months in your circle is the most delightful thing I can imagine. I hope to be able to be of assistance to you in the development of your institute for aerodynamics."

He wouldn't be able to arrive until the end of September because of difficulties arranging the time and passage. Replying to Epstein at the same time, he wrote that he hoped to learn a lot of theoretical physics from him during his stay and particularly looked forward to discussing the Born-Heisenberg theory — "I hope the matter will eventually become simpler."

Von Kármán had also been invited to Japan to help establish the first aeronautical research laboratory there, so he took a year's leave of absence to accept the two invitations. He states in his autobiography that he wasn't thinking of any permanent change at the time; however, it is possible that the thought may at least have crossed his mind in 1926.

Growing German militarism and anti-Semitism were factors in von Kármán's decision three years later (with intensive coaxing from Millikan and Guggenheim) to accept the directorship of GALCIT. Actually anti-Semitism had already affected his career in 1922, when Ludwig Prandtl considered a post in Munich, which would have left open his prestigious chair in Göttingen. To many, von Kármán was the obvious successor, but he was not offered the position. Von Kármán does not mention the incident, but two apologetic letters in the von Kármán papers — from physicist Max Born and mathematician Richard Courant, both members of the natural sciences faculty in Göttingen and friends of von Kármán's —

tell the tale. When objections to von Kármán arose with doubts about the "ethnic composition" of the faculty, Born and Courant, also both Jewish, did not have the courage (or energy, wrote Born) to support his candidacy, even though they had the backing of noted mathematician David Hilbert. Born, in particular, felt miserable about his own disloyalty and weakness, he wrote von Kármán, but after fighting to bring James Franck with him when he accepted his own appointment at Göttingen (two Jews instead of just one!), he had no more strength left for battle.

Both Born and Courant excuse themselves for being pushed to act quickly and unanimously with the rest of the faculty, since the agricultural engineering faculty was eager to snatch the position for themselves; and Born doubts that von Kármán, with his technological leanings, would have wanted to come back to Göttingen anyway. It is, of course, unclear whether he would have accepted, and it turned out that Prandtl did not leave, in any case, but the fact that he was denied the honor of being asked to succeed his former teacher because of his Jewishness could not have failed to sound some sort of signal to von Kármán.

He was lucky after all. Courant still thought von Kármán was making a mistake to come to Caltech permanently in 1930, but when things started to get difficult under the Nazis only a very few years later, both Born and Courant, along with many others, wrote to von Kármán, now safely installed in California, for help in finding positions outside of Germany.

Von Kármán did arrive as promised in September 1926, redesigned GALCIT's wind tunnel with eventual extraordinary scientific results, lectured to large audiences at Caltech and in Washington, and visited several other universities before traveling on to Japan. Although he was appalled by "the complete dearth" of applied mathematicians in the U.S. (he wrote to Courant that he found this particularly remarkable in such a highly industrialized country), he returned in 1928 for an exchange semester (Epstein went to Aachen). He declined the directorship of GALCIT at that time, but in 1929 Millikan's persistence (and \$15,000 more in the promised budget) paid off, and von Kármán finally accepted. In the years at Caltech, from 1930 onward, von Kármán presided over the emergence of American aviation and rocket propulsion into a position of world dominance. □