

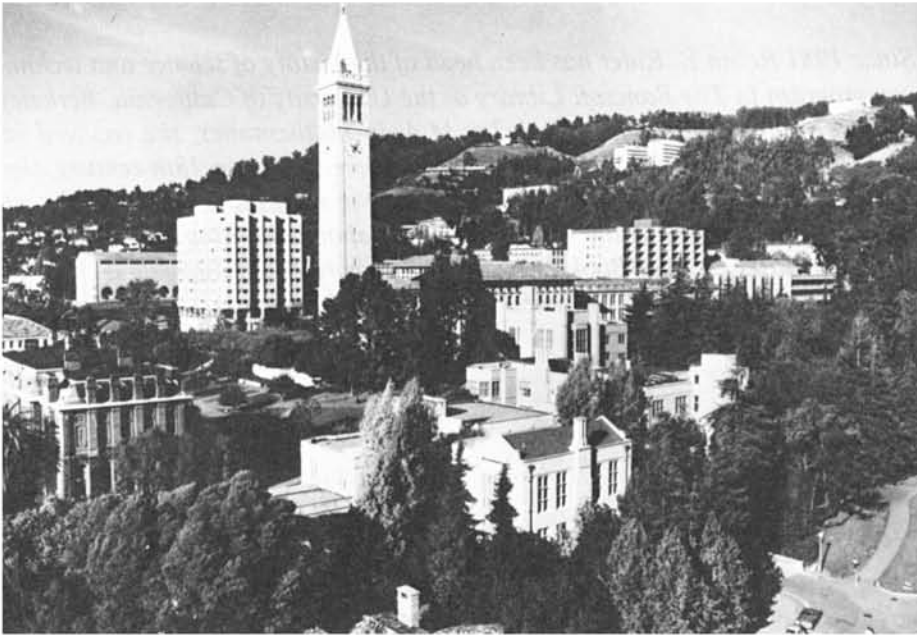
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## **An Opportune Time: Griffith C. Evans and Mathematics at Berkeley**

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In May 1935, at the end of Griffith C. Evans' first year at the University of California, his colleague at Brown University, R. G. D. Richardson, commented on Evans' plans for the Berkeley department: "He hopes to build up [there] a great center in our subject comparable to Princeton, Harvard, and Chicago . . ." [1]. Evans' vision was one of a top-flight department strong in research as well as teaching, emphasizing both standard areas of mathematics and newer fields and applications, able to recruit talented students and postdoctoral fellows.

Evans' own accomplishments would have added luster to any department. His work ranged over a number of mathematical topics, from analysis to applied mathematics and mathematical economics. He earned his Ph.D. at Harvard in 1910 with a dissertation on integral equations; he later expanded on this work in a set of Colloquium Lectures for the American Mathematical Society, which appeared in 1918 as *Functionals and Their Applications: Selected Topics, Including Integral Equations*. In a series of papers beginning in 1920 he examined surfaces of minimum capacity; he published another AMS volume, *The Logarithmic Potential*, in 1927; and, in line with his abiding interest in the applications of mathematics, he helped to develop dynamic theories of economics. Shortly after the great crash of 1929 he published an influential textbook on mathematical economics.



View of the Berkeley campus in 1972. Evans Hall (dedicated in 1971) appears immediately to the left of Sather Tower.  
(Photograph, University Archives, The Bancroft Library.)



Griffith Conrad Evans (1887–1973), ca. 1939.  
(Photograph, University Archives, The Bancroft Library.)

Evans enjoyed the respect of colleagues at home and abroad. The American Mathematical Society elected him vice president for 1924, and beginning in 1927 Evans served as an editor of the *American Journal of Mathematics*. In 1931 he was elected vice president (for mathematics) of the American Association for the Advancement of Science; five years later he would hold the same office for economics. His accomplishments were recognized in 1933 with election to the National Academy of Sciences [2].

## INSTITUTIONAL MANDATE

Forward-looking administrators, scientists, and engineers at Berkeley also envisioned a first-class mathematics department at the University of California. There was a clear institutional mandate for change. Shortly before World War I Berkeley began to invest heavily in both physical plant and personnel, with the intent of building a university with strengths in both research and teaching. The choice of Gilbert N. Lewis to head the chemistry department was an integral part of the program for change. In December 1911 Lewis made his initial visit to the Berkeley campus. A few days later he bombarded the university president with his ideas for change. "I believe that such a reorganization of the Department of Chemistry, as I have here suggested, would make this Department strong and efficient in instruction and research and that with the right men, whom I feel sure could be secured, this laboratory would assume high rank and reputation among the best Chemical Laboratories of the world." Lewis had in mind to build a department that rivaled the research institutes organized on the German model. His initial 2-year plan, for example, called for a new chemistry building plus a 75% increase in the department's annual budget in order to cover new appointments and equipment [3]. He got much of what he asked for, and before long the investment in salaries and research programs paid off, yielding a chemistry department of "national standing" [4].

In the 1920s the University of California applied the technique to physics. It instituted a physics department research budget, which grew to \$13,000 per year by 1930, and constructed a new building to house the department's teaching facilities, research laboratories, and offices. With the new emphasis on research, less productive faculty members saw their job security evaporate; meanwhile, efforts at recruitment redoubled. Among the desirable prospects was a young experimentalist from Yale, Ernest O. Lawrence, who rejected Berkeley's initial offer in 1927. The department then turned to another candidate, who accepted. In 1928 Berkeley upgraded their offer to Lawrence, stressing the university's commitment to the support of research. This time the appeal succeeded. Within five years of his arrival at Berkeley, Lawrence obtained a patent for what he dubbed a cyclotron, established the Radiation

Laboratory to house larger versions of the machine, arranged for local industry to contribute obsolete equipment, attracted philanthropic support, and made use of G. N. Lewis' unique store of heavy water in significant experiments. The year 1929 saw two more appointments in physics, including a halftime post for the theorist J. Robert Oppenheimer, who would split his time between Berkeley and Pasadena [5].

As the mandate for change took effect in chemistry and physics, the campus administration and faculty members in science and engineering recognized the pressing need for a similar transformation in the mathematics department. One administrator commented that the department had "not been maintained at the proper standard"; it seemed to most observers "rather dead." The mathematics faculty was not known for its research productivity, and other science departments wanted their own programs matched and buttressed by a mathematics department at full strength [6].

The department needed new blood. There had been only two department heads in the preceding sixty years. The more recent of these, Mellen W. Haskell, had begun to function as department head in 1909 [7]. His retirement, projected for 1933, together with other unfilled professorial posts in the department, presented an appropriate moment for change. (Appendix A lists members of the mathematics faculty for the years 1930–1950.)

Though the time was ripe for significant institutional changes, the harsh economic climate interfered with the search for a new chairman. Since the income of American colleges and universities followed general business trends with about a two-year lag, university income fell to a low point in 1933–1934, and faculties and administrators grappled with harsh economic realities as best they could. Fear spread about academic unemployment, and junior faculty in many institutions waited for the axe to fall. The most common economic adjustments, however, were deep cuts in equipment and supplies, freezes in hiring and capital improvements, and salary reductions, rather than layoffs.

Salary reductions were especially common at colleges and universities in the western United States. In Sacramento, for example, the legislature panicked and ordered severe cuts in funding for the University of California: over the course of two years the budget was cut "from \$17,000,000 down to \$12,800,000." Raymond T. Birge, new chairman of the Berkeley physics department, predicted that the corresponding salary reduction would have to amount to 10%, while the expense and equipment funds for the department would have to be cut by a third. (He was only slightly too pessimistic: salary cuts at Berkeley were eventually held to 7%.) [8]

Although it faced economic constraints in the salary it could offer, the university committed itself in 1932 to recruiting a new chair for the mathematics department [9]. The projected departmental "reorganization," which

would involve dismissals of several junior faculty, would free at least two instructorships as well. The plans for restructuring the department did not sit well with everyone. The retiring chairman not only viewed the emphasis on research as slighting the value of teaching; he also sympathized with the plight of junior faculty and regarded any dismissals “at the very depth of the depression [to be] most cruel” [10].

But University of California president Robert Gordon Sproul persisted, and appointed a blue-ribbon committee to assess the state of the mathematics department and make plans for the future. The committee he chose had an important stake in the promotion of scientific research at Berkeley. Chaired by G. N. Lewis, architect of the Berkeley chemistry program, the committee also included Raymond Birge of physics; Charles Derleth, Jr., dean of engineering; Joel Hildebrand of the chemistry department; Armin O. Leuschner, chairman of astronomy and of the university board of research; and B. M. Woods, chairman of mechanical engineering. The committee decided on a nationwide search. They assigned Hildebrand the task of seeking advice and sizing up the possibilities for new appointments; to fulfill his mission Hildebrand traveled around the country meeting with experts and prospects alike [11]. Acting on his advice the committee unanimously recommended in 1933 that the University of California offer the position of department chairman to Griffith C. Evans of Rice [12].

The salary offer was a generous one of \$9000, less the yet unspecified reduction for all faculty salaries. The committee suggested an extra inducement — that Evans be allowed to fill “several additional positions” in the department [13]. The powerful budget committee of the University of California added its unanimous endorsement to the Lewis committee’s recommendation to hire Evans, despite their preference for leaving vacancies unfilled as an economy measure: the need for “reorganization of the Mathematics Department, . . . long . . . projected on Professor Haskell’s retirement, . . . was again approved even after the present financial prospects were realized.” The budget committee underscored the need to invigorate a department “with intimate relations to the welfare of other important departments such as Physics, Chemistry, Engineering, Economics, and Astronomy” (a position in full agreement with that of Lewis’ committee). Moreover, the budget committee insisted, reform had to come from outside. “The department is in vital need of leadership, which, in the judgment of the Committee, cannot be found in the present membership; and the availability of an exceptionally strong leader at this moment is an opportunity which . . . should not be allowed to pass, whatever the conditions may be.” Sproul accepted these recommendations and sweetened the offer by making clear to Evans that the way was prepared for a complete reorganization of the department [14].

But Evans had strong ties to Rice and to Texas. He was also troubled by the vagueness of the financial arrangements, since he would likely suffer in

extricating himself from the depressed housing market in Texas. He thus decided once again to decline a Berkeley offer. This turn of events occasioned anxious correspondence and consultation back in Berkeley. Provost Monroe Deutsch kept Sproul informed: "Hildebrand points out that after the three weeks [he spent traveling] throughout the country there was no doubt in his mind but that Evans was by far the best man for our situation." Hildebrand and Leuschner both expressed concern about settling on an appropriate second choice; certainly it was too late to secure someone for the coming academic year. "Moreover, if he is of the right timber we would probably have to offer him as much as we would offer Evans." And appointing even a temporary chairman from within the troubled department posed serious problems, especially with regard to repopulating the faculty. "[O]ne of the most desirable features in reference to calling a new chairman was that he should have the obligation of selecting the persons to replace those who were to be dropped." Leuschner's and Hildebrand's appeals echoed the budget committee's concern for "the key importance of the work in mathematics for the fields of Chemistry, Physics, Astronomy, etc." Campus scientists, who had "long looked forward to this opportunity to place the work in Mathematics on a high plane," feared that the chance might be lost [15].

Deutsch suggested to the budget committee that they firm up the salary offer to Evans. The committee followed his advice, and also proposed that Evans might delay his move to Berkeley until August 1934 should he consider that necessary. Sproul transmitted the enhanced offer; others chimed in. Professor Woods wrote Evans concerning his service on the special committee, and explained that some years ago he himself had been "for five years a member of the mathematics department." Woods assured Evans that other campus units, including physics, chemistry, and the several engineering departments, were eager to cooperate with him in developing the mathematics program. Woods also thought Evans should know "that conditions are especially favorable just now for the building of a great mathematics department at the University of California. I am confident that opportunities for additions to the staff will come fairly promptly. . . ." In fact, Evans had by May 1933 resolved to accept the revised offer. He took the university up on its suggestion that he might defer his appointment to 1 July 1934, and asked Sproul to keep the appointment confidential until the fall of 1933 [16].

Postponing Evans' move to Berkeley until the academic year 1934–1935 necessitated the appointment of a temporary chairman, Professor Charles Noble, from within the ranks of the department. Other posts also required filling. Again, Hildebrand's nationwide survey work guided the search. Hildebrand submitted to Sproul lists of "young mathematicians fully qualified, in my opinion, for Instructorships in the University of California." Among those Hildebrand had interviewed personally were Charles B. Morrey, with a specialty in real variables; Alfred Foster, interested in the foundations of

mathematics and in mathematical physics; and Ralph D. James, a specialist in number theory [17]. Noble consulted with Hildebrand and recommended Morrey and Foster for instructorships. Evans agreed that both would be valuable additions to the department, and Morrey and Foster joined the faculty beginning in fall 1933. Noble also reminded Sproul that opportunities for more new appointments lay ahead: Noble and the elder Lehmer would reach retirement age in four years; Irwin, in five. And Florian Cajori's professorship was still vacant [18].

## REPERCUSSIONS OF EUROPEAN EVENTS

Political events in Europe affected opportunities for building the Berkeley department. Interested parties in various departments, unaware of Evans' appointment, called attention to the availability of an unnaturally large pool of potential nominees for the chairmanship, as a consequence of a brutal policy just enunciated in Germany. On 7 April 1933, only three months after Hitler became chancellor, a key piece of the National Socialist program was enacted in Germany. In the name of the Reich, non-Aryans lost state positions, including faculty posts in universities and research institutes; the National Socialists also dismissed Aryans whose loyalty they questioned. Foreigners employed in German universities likewise faced possible dismissal. The *Manchester Guardian Weekly* listed in May 1933 the names of some 200 professors purged in the first month; the list included a dozen mathematicians and physicists. By mid-1935, 100 physicists and 60 mathematicians had been dismissed. In the course of just two years German science thus lost one-quarter of the nation's physicists and one-fifth of its mathematicians. Still others resigned their posts in protest and joined the ranks of the displaced. Where before the German academic system, anchored in the virtues of research, had inspired imitation, now it was left in shambles by racial and political purges.

If the National Socialists did not recognize the value of those whom they discarded, foreign colleagues did. As Monroe Deutsch put the point, here was the chance to "profit by the stupidity and brutality of the German government" [19]. Displaced scholars and scientists looked to Great Britain and the United States for assistance. The announcement of the founding of the Society for Protection of Science and Learning appeared in British newspapers on 24 May 1933; the first contributions arrived in the next day's mail. The SPSL sought to coordinate the placement efforts by individual British scholars and British institutions.

The Society's American counterpart was the Emergency Committee in Aid of Displaced Foreign Scholars, founded a few weeks later. Its membership included the presidents of seventeen American colleges and universities, among them Robert Gordon Sproul of the University of California; its program was

the solicitation of philanthropic support to permit American institutions temporarily to add refugee scholars to their staffs.

As a member of the Emergency Committee, Sproul received copies of the lengthening lists of displaced scholars. The Emergency Committee list of June 1933, for example, included 25 mathematicians and 16 physicists, out of a total of 350 names. Two months later a list arrived with more than 500 names, including 59 mathematicians and 67 physicists. The Berkeley physics department annotated the second list for Sproul's office, identifying 6 young physicists of interest to the department [20].

The names of mathematicians also stirred considerable interest. Max Radin proposed appointing Professor Edmund Landau, at least temporarily. Others, including Noble, recommended importing Richard Courant, who had taught at Berkeley in the summer session several years earlier. Deutsch, though less than enthusiastic about the wisdom of appointing Landau, pursued the idea of securing Courant's services. Sproul, however, could not see how Berkeley could "permanently finance a permanent appointment" for Courant at the rank of full professor. He also explained to Noble the need to consult with Evans [21]. Noble appreciated these difficulties and proposed the temporary expedient of calling for one year or one semester "a man of the distinction and adaptability of Dr. Courant" — if not Courant, perhaps Konrad Knopp of Tübingen. Both Leuschner of the astronomy department and Woods of mechanical engineering concurred in the wisdom of offering Courant a temporary appointment for winter 1934 [22].

The invitation was issued in summer 1933 (shortly after Evans had accepted the Berkeley offer), but Courant had already taken up an offer to spend the year at Cambridge University. Berkeley renewed the invitation, this time for fall 1934; the invitation reached Courant just as he accepted a post, perhaps permanent, at New York University [23]. Word of the offer reached Evans, who remonstrated to Deutsch that it was not to the advantage of a university to appoint foreigners to major posts when no reciprocal appointments were possible abroad. "I fear that the result is to discourage the legitimate aspirations of our own young scholars, and that the process has already been carried too far" [24].

Evidently Evans had heard a misleading rumor concerning Courant. Deutsch hastened to inform Evans that Courant had been offered an appointment for one semester only; in fact, Deutsch added, it seemed likely that Courant would instead take a permanent position in New York. Deutsch, who was working hard to marshal support for displaced foreigners, gently chided Evans for his attitude toward their placement in American institutions: "You see, therefore, that there is no plan to fill major appointments with foreign professors. On the other hand, you will, I am sure, agree with me that we should recognize the solidarity of professors and do a little at least to assist scholars who were deprived of their posts for reasons which cannot



commend themselves in the slightest degree to their colleagues in other lands” [25].

## BUYER’S MARKET

By the end of his first year at Berkeley, Evans had a change of heart about bringing in Europeans to replace retiring faculty and build the Berkeley mathematics department. In spring 1935 R. G. D. Richardson, leader of the mathematics program at Brown University, wrote to Evans about Brown’s experience with displaced European mathematicians, among them Hans Lewy, a specialist in the theory of differential equations, who had come to Brown for 1933–1934 and 1934–1935. Changes in the curriculum requirements for Brown University students meant that its mathematics department could not keep Lewy on. Richardson assured Evans that, “With his fine sensitiveness, [Lewy] wishes to avoid replacing some American mathematicians; but there are sure to be places where in graduate work and upperclass work he can occupy a niche that would otherwise be difficult to fill.” Richardson put the point more forcefully in a letter to Edward R. Murrow of the Emergency Committee: “Lewy would fit excellently” into Evans’ plans to build a great center at Berkeley [26].

Encouraged by Richardson’s optimism that funds might be found elsewhere to tide Lewy over while he sought a permanent position “one or two years hence,” Evans recommended a temporary appointment at Berkeley for Lewy. “[His] work is already well and very favorably known to my colleagues at Berkeley and to myself.” Indeed, Courant had already talked up Lewy during his visit to Berkeley in 1932. Lewy’s name had also figured on the Emergency Committee list received in Sproul’s office in June 1933. There Lewy was identified as “one of [the] two best mathematicians living of about his age” (sic) [27]. Evans thought it “fair to let [Lewy, then 31 years old] compete and cooperate here with other young men in our department, and I recommend that we offer him the possibility of a regular appointment. . . on the retirement of Professor Noble. In the meantime he might be designated as ‘lecturer.’”[28]

The university administration pondered this suggestion, and its implications for the growth of the mathematics department. They queried Evans: “If only one appointment were to be made to replace these three [Noble, then D. N. Lehmer in 1937, and Irwin in 1938], would Dr. Lewy be your choice?” Might not young men now in the department and deserving of salary increases have some “prior claims” on available funds? Sproul also doubted the wisdom of making current financial commitments based on impending retirements [29].

The queries spurred Evans to outline his plans for the department. Though he agreed that “retirement of senior members should in general be compensated by appointments at the rank of instructor,” in accordance with Sproul’s general policy, Evans also recalled the commitment to a strong mathematics program underlying his own appointment. Evans argued that “[o]ne major appointment of a mathematician with an already established reputation might be defended” on the grounds that it would help the mathematics department “to improve its reputation for original investigation with more than usual rapidity.” He proposed trying Lewy out for a year without obligation or expense — a solution made possible by the fund-raising efforts of the Emergency Committee and the Rockefeller Foundation. After the grants ran out, “the stricture of the budget” could be invoked as “an excuse that will be in no way humiliating to him not to keep him on if he does not live up to our highest expectations.” Out of fairness to young Americans, Evans envisioned a slower schedule of promotion for Lewy than for indigenous personnel [30].

Evans’ plan to appoint Lewy met with administrative approval, and Berkeley then sought grants in partial support of his salary for 1935–1936. The university applied to the Emergency Committee, which had already helped fund temporary positions at Berkeley for other displaced scholars, and to the Rockefeller Foundation for matching funds. Both came through with grants for Lewy’s salary for 1935–1936 (and in fact for 1936–1937). By spring of 1936 it was the unanimous recommendation of Evans and the other senior members of the department that Lewy be offered a position as assistant professor at the end of the two-year period. As Sproul later explained to the Rockefeller Foundation, Lewy’s “extremely rapid rise in rank [at Berkeley] tells its own story as to how [he] has contributed to the department” as a teacher and as a creative scholar [31].

Economic improvement in the second half of the decade, combined with retirements of senior personnel, also assisted Evans in implementing his plans for change and growth. The department hired a local product, Raphael M. Robinson, in 1937 [32]. In the next three years Berkeley secured the services of Anthony P. Morse, a specialist in real variables, and the number theorist Derrick H. Lehmer, as well as several instructors for one-year stints in the department.

## TAKING STATISTICS SERIOUSLY

In these same years Evans began to polish another facet of his plans for the mathematics department. He later recalled that his conversations with the noted statistician R. A. Fisher of University College, London, planted in his mind the idea of a major statistics program. By the time he had assessed the situation at Berkeley, Evans “envisaged California as the place for a really outstanding statistician” — indeed, the place for a program “superior

to anything in the West.” The administration required some convincing. In 1936 Evans wrote to E. B. Wilson of the Harvard School of Public Health, “I am doing my best to induce the University of California to take theoretical statistics seriously, and thus provide in the Department Mathematics a center for advice and research with respect to the practical applications which are being made in other departments of the University. The ultimate [objective] would presumably be some sort of Board of Statistics with suitable laboratory equipment” [33].

Initially Evans suggested to Sproul that they hire Fisher’s successor at the statistical department of Rothamstead Experimental Station, England. In the succeeding months Evans continued to investigate the “possible use of a theoretical statistician in the Department of Mathematics.” He sent inquiries to knowledgeable colleagues in various fields, including physicist R. H. Fowler of the Cavendish Laboratory at Cambridge, mathematical physicist E. T. Whittaker of Edinburgh, mathematician Oswald Veblen of the Institute for Advanced Study, statisticians H. L. Rietz of the State University of Iowa and Harold Hotelling of Columbia, as well as Wilson and Fisher.

In order to enlist the support of his allies elsewhere on the campus, Evans recommended to Sproul that a committee be convened “to consider the situation,” to include representatives from genetics, economics or commerce, agricultural economics, physics, psychology, and perhaps anthropology [34]. Evans’ plan for statistics at Berkeley coordinated well with his work on the mathematical theory of economics; the plan also spoke to the growing importance of statistics to other fields in the natural and social sciences.

Evans added more names to his list of possibilities. By the following year the list included a versatile Polish statistician, Jerzy Neyman, then working at University College, London. Word of Neyman’s talents had reached Berkeley via W. E. Deming, a U.S. government statistician, who had worked with Birge. Complicated negotiations eventually brought Neyman to the Berkeley campus in 1938–1939. As in 1933, the wide-ranging search for an appropriate candidate had involved representatives of campus departments — especially Raymond Birge of physics, whose enthusiasm for statistical studies carried considerable weight at Berkeley. As in Lewy’s appointment, political events in Europe — in particular, Poland’s plight — made available a specialist who fit into Evans’ plans [35].

The confidence in Neyman was not misplaced. In his first few months at Berkeley, Neyman established many contacts with “biologists, physicists, economists, etc.” He found that statistical applications involved in their research projects “almost invariably throw a new light on various sections of the mathematical theory of probability and frequently suggest new mathematical problems.” One such application was the statistical study of mutations in genes bombarded with products of the cyclotron’s operation [36]. Although Evans and Neyman would come to differ about the proper place of a

statistics program (within the mathematics department or independent of it), Evans added his enthusiastic endorsement to Neyman's requests for space, equipment, and administrative support for the growing statistical laboratory. Evans had high praise for Neyman, noting his great success in working with natural and social science departments and his unique command of both theory and applications [37].

## CONFRONTED BY WAR

Neyman was fortunate to escape the fate awaiting many Poles. The Nazification of the European continent, in Hermann Weyl's phrase, added urgency to the task of rescuing displaced scholars. By late 1940 assistance agencies responded with new programs to secure American posts for deposed "scholars of eminence." Sproul, informed of these programs, thought it possible that the University of California could absorb a few of the scholars thus available using either its own resources or this new source of funds. Sproul asked Evans to chair a campus committee to identify four or five foreign scholars "whose presence would be advantageous to the University." The committee, which did not in fact confine its consideration to the list provided to Sproul in late 1940, settled upon five names, including that of the eminent Polish logician and mathematician Alfred Tarski. With assistance from the Rockefeller Foundation's program of Aid for Deposed Scholars, Tarski joined the Berkeley faculty in 1942 [38]. He proceeded, with Evans' encouragement and campus support, to weld an active and prestigious program in logic and the foundations of mathematics. The year 1942 also brought to the Berkeley department another refugee from Hitler's Europe, Frantisek Wolf, a specialist in Fourier analysis and complex variables.

Hitler's march across Europe meant more direct challenges to American mathematics. As president of the American Mathematical Society in 1938–1940 Evans pressed for the establishment of a joint AMS–MAA committee on war preparedness, to address questions of mathematical research and training for the military. Evans also worked with the National Research Council in their compilation of a national scientific roster in 1940. He was convinced that American mathematics could play a significant role in the nation's war effort.

A few months after Pearl Harbor the Berkeley department was already involved in special training programs, and the staff of the Statistical Laboratory found themselves "heavily engaged" in war-related research. Evans joined the wartime Applied Mathematics Panel, part of the National Defence Research Committee (NDRC), which contracted with eleven universities to furnish mathematical service and advice to the Army, Navy, and the NDRC. One such contract for statistical research went to Neyman at the University of California. The statistical research groups funded by the panel tackled

probabilistic and statistical aspects of bombing problems, damage studies, and quality control. Neyman's services were in such constant demand that he was often dispatched on lengthy missions elsewhere. In 1944, for example, he participated in the planning of bombing operations against Japan. During his absence, George Pólya, by then at Stanford University, took over Neyman's graduate courses at Berkeley [39].

## ASSESSING THE IMPACT

By most measures the first few years after World War II witnessed dramatic growth in the University of California. Nine mathematicians had joined the faculty between 1933 and U.S. entry into the war; seven more came between 1942 and 1948. (See Appendix A.) By 1949, when Evans turned over the chairmanship of the department, the number of faculty members in mathematics was thus double the number when he arrived at Berkeley fifteen years earlier.

Graduate enrollment also swelled. Between 1929–1930 and 1939–1940 the number of graduate students in all fields at Berkeley increased gradually from 2515 to 3539; by 1949–1950 the total had reached 6066. The number of Ph.D.s granted in mathematics grew accordingly. In the fifteen years before Evans' appointment the department granted a total of only thirty doctoral degrees, while the physics department granted more than one hundred. During Evans' fifteen years as chairman, production picked up to 55 Ph.D.s in mathematics and statistics (an increase of 83%), compared to 114 Ph.D.s in physics. In the last year Evans served as chairman (1949), Berkeley granted ten Ph.D.s in mathematics and statistics [40].

In assessing Evans' impact on the mathematics department, it is natural to draw comparisons to the record of achievement in physics at Berkeley. Like the Berkeley research and teaching program in physics, the mathematics department both suffered and benefited from the Depression. Both fields coped with slashed salaries, faint job prospects, and increased enrollments. At the same time, good help was easy to find. E. O. Lawrence took advantage of highly-trained volunteers in populating the Radiation Laboratory; Evans heard in 1934 that "the present is an excellent time to purchase most able young men at a reasonable price." In building the mathematics department Evans recruited some of these young Americans, and profited from the availability of displaced foreigners and from the philanthropy that facilitated their absorption in American institutions. Those years, Evans recalled, were "an opportune time, when there were more fine mathematicians available than there were places for them to go" [41].

Evans had arrived at Berkeley with a mandate to build a research program in mathematics. By comparison to the scaled-up expenses and expectations of Berkeley physicists, the material needs of the mathematics department

remained comparatively modest throughout the 1930s. But Evans' insistence on productivity and the infusion of new blood brought results.

In the first year after Haskell's retirement, the interim chairman reported "substantial" research activity in the mathematics department. Evans added his encouragement. In 1936 he reported that the department was devoting "principal effort" to increasing "its contribution to scholarship"; he had also introduced an element of flexibility in the subject matter of graduate seminars in order to follow "modern developments" in mathematics. Two years later Evans praised the "noteworthy" research accomplishments of department members. By the end of the decade Evans urged the rehabilitation of a mathematics publications series at the University of California, and noted the increase in the number of pages published by department faculty in national journals [42]. Ambitious plans for research at the Statistical Laboratory prompted appeals to the campus administration and the Rockefeller Foundation for additional space, equipment, and staff [43].

As they applied their knowledge and skills to matters of national defense, members of both departments learned valuable wartime lessons. Evans, like his colleagues in physics, sat on councils of war and helped shape his profession's response to military needs and demands. Mathematics and statistics at Berkeley contributed to the war effort and partook of the bounty; and in the immediate postwar years the department accustomed itself to look to the government both for research support — what Evans called the "gravey train of government contracts" [44] — and for jobs for its students. The Berkeley mathematics department thus entered the second half of the 20th century with an eminent and productive faculty, the promise of governmental research support, and the prospect of positions for a new generation of students.

A quarter-century before Berkeley had first looked to Evans to provide energetic leadership for its mathematics program. His arrival at Berkeley was engineered by scientists and engineers eager for a revitalized mathematics department; economic considerations at first constrained his plans for building the faculty, but the availability of European scholars and philanthropic support shortly offered unprecedented opportunities; under his leadership the department stood ready to contribute to the war effort and to benefit from the changes it brought to American science. Thus was realized the ambition of a major center of mathematical research and teaching at Berkeley, which long bore the stamp of Griffith C. Evans' personality and vision.

## NOTES

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Evans, the Rockefeller Foundation Archives, New York Public Library, and The Bancroft Library for permission to quote from manuscript materials. The following abbreviations are used in the notes:

- BL The Bancroft Library, University of California, Berkeley
- CU University Archives, BL
- EC Emergency Committee in Aid of Displaced Foreign Scholars papers, New York Public Library, Rare Book and Manuscripts Division
- GCE Griffith C. Evans papers, BL
- JN Jerzy Neyman papers, BL
- RF Rockefeller Foundation Archives, North Tarrytown, New York
- RTB Raymond T. Birge papers, BL.

Quotation, Richardson to Murrow, 3 May 1935 (EC, 109/University of California 1935).

2. Charles B. Morrey, Jr., "Griffith Conrad Evans," U. S. National Academy of Sciences, *Biographical Memoirs*, 54 (1983), 127–155; Morrey, H. Lewy, R. W. Shephard, and R. L. Vaught, "Griffith Conrad Evans," University of California, *In Memoriam*, 1977, 102–103. Cf. draft biographical notices in GCE.

3. Lewis to Benjamin Ide Wheeler, 9 Dec 1911 (CU-30, 4/26).

4. "Joel Henry Hildebrand: Physical Chemistry at the University of California," interview by A. L. Norberg (BL, 1980), pp. 7, 14.

5. Robert W. Seidel, *Physics Research in California: The Rise Of a Leading Sector in American Physics* (Ph.D. dissertation, University of California, Berkeley, 1978) pp. 94–104, tables 1–3; J. L. Heilbron, Robert W. Seidel, and Bruce R. Wheaton, *Lawrence and His Laboratory: Nuclear Science at Berkeley 1931–1961* (Berkeley, 1981), pp. 9–13.

6. Monroe Deutsch to the university president, 1 Sep 1932 (CU-5, 1932/100-Mathematics). Even the department chairman recognized the problem. Mellen W. Haskell to Evans, 25 Oct 1928: "We have an excellent staff of teachers, but they have never been strong in research. I think we should have the approval of the administration in building up in that direction . . . ." (GCE, carton 6/"Leaving Rice"). In R. G. D. Richardson's report in 1933 on five American Mathematical Society publications, the University of California ranked only fifteenth in the number of pages published in the period 1926–1932; it ranked even lower when only pages in the AMS *Transactions* were counted (RF 1.1/200/125/1542). On the level of investment in senior faculty salaries in mathematics, see *Departmental Budget Recommendations, Biennium 1933–35* (CU). Comparison of recommendations for mathematics and physics affords indirect evidence of the need for younger blood in the mathematics department.

7. *The Centennial Records of the University of California*, ed. Verne A. Stadtman et al. (Berkeley, 1967), pp. 90–91.

8. Monroe Deutsch to Eva Deutsch, 1 Nov 1933 (CU-5, 1933/800); Robin E. Rider, "Alarm and Opportunity: Emigration of Mathematicians and Physicists to Britain and the United States, 1933–1945," *Historical Studies in the Physical Sciences*, 15 (1984), 107–186, on 126.

9. Budget Committee [to Robert Gordon Sproul], 17 Sep 1932 (CU-5, 1932/100-Mathematics).

10. Haskell's opinion reported by Deutsch to Sproul, 25 Feb 1933 (CU-5, 1933/1-Mathematics). On teaching versus research in American mathematics in the 1930s, see Rider, "Alarm and opportunity," 134–135.

11. Lewis to Sproul, 7 Dec 1932 (CU-5, 1932/100-Mathematics).

12. Evans' name had come up before. In 1927, for example, W. W. Campbell, president of the University of California, had offered Evans the maximum salary paid at Berkeley (and indeed, more than any other salary in the mathematics department) and had held out the promise that Evans should "assume leadership" in the department at Haskell's retirement. Evans resisted, and cabled back: "Very much appreciate generous offer and magnificent opportunity. Decline regretfully." Campbell to Evans, 14 Dec 1927; Evans to vice-president W. M. Hart, 17 Dec 1927 (GCE, 6/"Leaving Rice"). Cf. Evans to Leuschner, 1 Apr 1933 (CU-5, 1932/100-Mathematics). In fact, the negotiations dragged on until early 1929, but to no avail.

13. Lewis to Sproul, 7 Mar 1933 (CU-5, 1933/1-Mathematics). Cf. draft in RTB ("Lewis").

14. Budget Committee recommendation, 20 Mar 1933; Sproul to Evans, 31 Mar 1933 (CU-5, 1933/1-Mathematics).

15. Deutsch to Sproul, 17 Apr 1933 (*ibid.*).

16. B. M. Woods to Evans, 5 May 1933; Evans to Sproul, 6 May 1933; Evans to Sproul, 23 May 1933 (*ibid.*). Evans' official acceptance was in fact dated 23 Oct 1933.

17. Hildebrand to Sproul, 7 June 1933 (*ibid.*).

18. Noble to Sproul, 12 June 1933 (*ibid.*). James joined the faculty in 1934, then moved on at the end of the decade.

19. Deutsch to Sproul, 25 July 1933 (CU-5, 320).

20. Lists in CU-5, 1933/800.

21. Deutsch to Hugo D. Newhouse, 16 May 1933 (CU-5, 1933/800); Sproul to Noble, 21 June 1933 (CU-5, 1933/1-Mathematics).

22. Noble to Sproul, 30 June 1933. Noble renewed the appeal concerning Courant in a letter to Deutsch of 9 July 1933 (*ibid.*).

23. On the Berkeley invitations, see Constance Reid, *Courant in Göttingen and New York. The Story of an Improbable Mathematician* (Springer-Verlag, New York-Heidelberg, 1976), 155–158; cf. Deutsch to Jacob Bellikopf of



the Federation of Jewish Charities of Philadelphia, 21 Sep 1933 (CU-5, 1933/800).

24. Evans to Deutsch, 22 Jan 1934 (CU-5, 1934/1-Mathematics).

25. Deutsch to Evans, 25 Jan 1934 (ibid.).

26. Richardson to Evans, 13 Mar 1935 (CU-5, 1935/1-Mathematics); Richardson to Murrow, 3 May 1935 (EC, 109/University of California 1935).

27. Evans to Sproul, 26 Mar 1935 (CU-5, 1935/1-Mathematics); Reid, *Courant*, pp. 133-134; list received 26 June 33 (CU-5, 1933/800). Out of more than 350 names on the list, 25 were mathematicians'.

28. Evans to Sproul, 26 Mar and 15 Apr 1935 (CU-5, 1935/1-Mathematics). Cf. Deutsch to Duggan, 25 Apr 1935 (EC 109/University of California 1935).

29. Sproul to Evans, 4 Apr 1935; cf. Budget Committee memorandum (CU-5, 1935/1-Mathematics).

30. Evans to Sproul, 15 Apr 1935 (ibid.). Evans projected for 1935–1936 a mathematics department composed of 7 professors, 2 associate professors, 5 assistant professors, 3 instructors (down from 5), and 4 teaching assistants, in addition to Lewy as lecturer. Of these, Evans and the other senior members of the department were keen to recommend promotion of Bing C. Wong, a specialist in algebraic and enumerative geometry, from assistant to associate professor.

31. Evans to Sproul, 13 Apr 36 (CU-5, 1936/1-Mathematics); Sproul to R. Fosdick of the Foundation, 20 Nov 1939 (RF 1.1/205/11/167). Cf. Deutsch to Duggan, 24 Jul 35 (EC, 109/University of California 1936).

32. Cf. Constance Reid with Raphael M. Robinson, "Julia Bowman Robinson (1919–1985)," *Women of Mathematics. A Biobibliographic Sourcebook*, ed. Louise S. Grinstein and Paul J. Campbell (Greenwood Press, New York, 1987), pp. 182–189, on 183.

33. Evans to E. B. Wilson, 25 Nov 1936 (GCE); drafts of "Brief history of the Department of Mathematics" (GCE, box 1).

34. "Brief history" (ibid.); Evans to Sproul, 20 Oct 1936 and 16 Dec 1936 (CU-5, 1936/1-Mathematics). Cf. Constance Reid, *Neyman — From Life* (Springer-Verlag, New York, 1982); "Report on statistics courses" [1 Jun 37], in CU-9, Committee on Courses minutes, vol. 9 (1934–1936 to 1938–1939), appendix for 16 Sep 1937. This was not the first time the question of a statistics center had arisen at Berkeley. E. B. Wilson advised Evans against putting into the mathematics department a "center for advice and research in respect to practical applications of statistics being made in other departments of the university." Wilson recalled that he had made the same statement during his half-year stay in Berkeley in 1929, when faculty and administrators had approached him for "some proposition that would

be attractive to me to come out there and be responsible for the teaching of theoretical statistics throughout the university.” Wilson to Evans, 1 Dec 1936. On the earlier discussion with Wilson, see CU-5, 1928/Mathematics.

35. Evans’ offer to Neyman, 10 Nov 1937 (RTB, “Evans”); cf. JN and CU-5, 1933/1-Mathematics. See the lengthy account in Reid, *Neyman — From Life*. Evans’ advocacy of the importance of theoretical statistics, as well as his long-standing interest in mathematical economics, was underscored by his appointment in 1938 as chairman of the section on “Probability, Statistics, Actuarial Science and Economics” for the International Congress of Mathematicians scheduled for Harvard University in 1940.

36. Neyman to Warren Weaver of the Rockefeller Foundation, 19 Apr 1939 (RF 1.1/205/11/168; copy in CU-5, 1939/1-Mathematics and in JN).

37. Evans to Marston Morse, 28 May 1941 (GCE, carton 14/AMS Preparedness Committee); Evans to Sproul, 14 Nov 1938 (CU-5, 1938/1-Mathematics).

38. Sproul to Duggan, 29 Oct 1940, and Duggan to Sproul, 7 Nov 1940 (EC, 109/University of California 1940); draft biography, ca. 1968 (GCE, carton 1); Evans to Sproul, 25 Feb 1941; Sproul to Evans, 11 Feb 1941 (GCE); Thomas B. Appleget, “The Foundation’s experience with refugee scholars,” 5 Mar 1946 (RF 1.1/200/47/545a); and the Alfred Tarski papers at BL.

39. Evans to Sproul, 23 Apr 42 (CU-5.1, Reports to the President, 4/75, Mathematics 1940–1942). Cf. GCE, carton 14; JN; and Harriet Nathan, [unpublished] “Report of the President of the University of California 1942–44” (CU).

40. University of California *Courses of instruction, General catalogue, Commencement Programs, and The Centennial Record*, ed. Stadtman et al. *Doctorate Production in United States Universities 1920–1962*, comp. Lindsey R. Harmon and Herbert Soldz (Washington, D.C., 1963), table 3, gives a national total of 747 Ph.D.s in mathematics for 1920–1934 and 1219 for 1935–1949; comparable totals for physics are 1240 for 1920–1934 and 2230 for 1935–1949. The Berkeley mathematics department thus outpaced the national expansion.

41. Heilbron, Seidel, and Wheaton, *Lawrence and His Laboratory*, p. 13; G. A. Bliss to Evans, 11 Jan 1934 (GCE, carton 1); Evans to Henry Helson, 12 Feb 1966 (GCE, box 1). Cf. Rider, “Alarm and opportunity,” 127–128.

42. Reports to the president for mathematics, 1933–1940 (CU-5.1).

43. RF 1.1/205/11/168.

44. “Introductory remarks” (GCE, carton 6/Applied Mathematics).

## APPENDIX A

## Mathematics Department Faculty

Appointments for Academic Years 1930–1931 through 1949–1950\*

Lecturer, instructor, or professorial ranks based on departmental lists in

*Courses of Instruction:*

Alder, Henry L.	1947–1948
Andrews, Anne D. B.	1930–1932
Apostol, Tom M.	1948–1949
Barankin, Edward W.	1947–1950
Bernstein, Benjamin	1930–1950
Bernstein, Dorothy	1942–1943
Brenner, Joel L.	1939–1940
Buck, Thomas	1930–1950
Burdette, Albert C.	1944–1945
Cajori, Florian	1930–1930 emeritus
Diliberto, Stephen P.	1947–1950
Dresch, Francis W.	1938–1946
Duncan, Dewey C.	1930–1935
Edwards, George C.	1930–1931 emeritus
Eudey, Mark W.	1944–1947
Evans, Griffith C.	1935–1950
Fix, Evelyn	1944–1950
Foster, Alfred L.	1933–1950
Garabedian, Paul R.	1949–1950
Goldsworthy, Elmer C.	1930–1949
Haskell, Mellen W.	1930–1932; 1933–1948 emeritus
Hayes, Charles A.	1946–1947
Hodges, Joseph L., Jr.	1948–1950
Horn, Alfred	1946–1947
Hughes, Harry M.	1949–1950
Hurst, John W.	1937–1938
Irwin, Frank	1930–1937; 1938–1948 emeritus
James, Ralph D.	1934–1939
James, Robert C.	1947–1950
Kelley, John L.	1947–1950
Lehmann, Erich L.	1946–1950
Lakness, Ralph M.	1949–1950
Lehmer, Derrick H.	1940–1950
Lehmer, Derrick N.	1930–1936; 1937–1938 emeritus
Levy [McDonald], Sophia H.	1930–1950
Lewy, Hans	1935–1950
Loeve, Michel	1948–1950
Mann, Henry B.	1948–1950

McDonald, John H.	1930–1945; 1945–1950 emeritus
Morrey, Charles B., Jr.	1933–1950
Morse, Anthony P.	1939–1950
Nelson, M. Lewis	1947–1948
Neustadter, Siegfried	1948–1949
Neyman, Jerzy	1938–1950
Noble, Charles A.	1930–1938; 1938–1950 emeritus
Owens, Owen G.	1945–1946
Pan, Ting K.	1949–1950
Pinney, Edmund	1946–1950
Pólya, George	1945–1947 visiting professor
Putnam, Thomas M.	1930–[1942]**
Riberito, Hugo B.	1948–1950
Robinson, Raphael M.	1938–1950
Roessler, Edward B.	1930–1933
Schaaf, Samuel A.	1945–1946
Sciobereti, Raymond H.	1930–1950
Scott, Elizabeth L.	1948–1950
Seidenberg, Abraham	1946–1950
Shephard, Ronald W.	1941–1942
Smith, Marianne F.	1948–1950
Sperry, Pauline	1930–1950
Stein, Charles M.	1947–1950
Swinford, Lee H.	1930–1950
Tarski, Alfred	1942–1950
Wakerling, Virginia W.	1944–1950
Walton, Lewis F.	1944–1946
Williams, Arthur R.	1930–1950
Wolf, Frantisek	1942–1950
Wong, Bing C.	1930–1945; 1946–1947 emeritus

\*In many cases, appointments through 1949–1950 extended well beyond 1950.

\*\*Faculty list lacking in *Courses of Instruction* for 1943–1944.