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CREATING A LIFE: EMIL ARTIN IN AMERICA

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1. Introduction

In January 1933, Adolf Hitler and the Nazi party assumed control of Germany. On 7 April of that year the Nazis created the notion of "non-Aryan descent".[1] "It was only a question of time", Richard Brauer would later describe it, "until [Emil] Artin, with his feeling for individual freedom, his sense of justice, his abhorrence of physical violence would leave Germany" [5, p. 28]. By the time Hitler issued the edict on 26 January 1937, which removed any employee married to a Jew from their position as of 1 July 1937,[2] Artin had already begun to make plans to leave Germany. Artin had married his former student, Natalie Jasny, in 1929, and, since she had at least one Jewish grandparent, the Nazis classified her as Jewish. On 1 October 1937, Artin and his family arrived in America [19, p. 80].

The surprising combination of a Roman Catholic university and a celebrated American mathematician known for his gnarly personality played a critical role in Artin's emigration to America. Solomon Lefschetz had just served as AMS president from 1935–1936 when Artin came to his attention: "A few days ago I returned from a meeting of the American Mathematical Society where as President, I was particularly well placed to know what was going on", Lefschetz wrote to the president of Notre Dame on 12 January 1937, exactly two weeks prior to the announcement of the Hitler edict that would influence Artin directly.

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[1] 7 April 1933: Gesetz zur Wiederherstellung des Berufsbeamtentums (Law for the Reconstitution of the Professional Civil Service).

[2] Art. 59 in the "Neues Deutsches Beamtengesetz" (New German Civil Service Law), later supplemented by the so-called "Flaggenerlass" of 19 April 1937.

PRINCETON UNIVERSITY

PRINCETON, NEW JERSEY

Department of
MATHEMATICS

January 12, 1937

My dear Dr. O'Hara:

A few days ago I returned from a meeting of the American Mathematical Society where as President, I was particularly well placed to know what was going on. Doubtless you will be interested to learn that the chief event discussed there was the appointment of Dr. Karl Menger of Vienna to a post at Notre Dame University. In so doing, it was generally felt that Notre Dame had added to its faculty one of the truly outstanding mathematicians in the world, a man still in his prime and with an exceptional capacity to inspire young men. No better choice could have been made and I wish to extend to you my warmest congratulations for this splendid move.

By way of making a constructive suggestion, I permit myself to name for your strong consideration another absolutely first rate man, the algebraist E. Artin, at the present time Professor at the University of Hamburg. He is an Austrian Aryan, but his wife is one-half Jewish. They have a couple of small children and you know the rest. Like Menger, Artin is in the middle thirties, famous not only as a first rate scientist but also as a teacher, and inspirer of youth, and is a most attractive personality. Although still very young he was in 1930, runner-up for the post of successor to Professor David Hilbert of Gottingen, himself an outstanding mathematical genius of all times. I may say that Professor Artin is coming to the United States in a few months on the way to Leland Stanford University where he shall teach next summer so that an easy and informal interview with him could no doubt be arranged.

With two such stars in your mathematical firmament you would outclass in this branch of learning all but a small number of the oldest universities. And your liberal attitude toward learning would find its just reward therein!

Sincerely yours,

S. Lefschetz,
Research Professor of Mathematics.

President John F. O'Hara, C.S.C.
University of Notre Dame
Notre Dame, Indiana

FIGURE 1. The cover of this issue; see [LH], a letter from Solomon Lefschetz to Father John O'Hara, 12 January 1937, Artin File (UCIS 101/43), University of Notre Dame.

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> With two such stars in your mathematical firmament you would outclass in this branch of learning all but a small number of the oldest universities. . . . [LH, Lefschetz to O'Hara, 12 January 1937].

Apparently, then, from his position within the AMS, Lefschetz learned of Artin's situation and took up his cause.[3] Fortunately, the president of Notre Dame, Father John O'Hara "made a place for him on the [Notre Dame] faculty. . . in order to relieve his mind of the strain under which he labored in Germany" [HW, O'Hara to H. B. Wells, 11 June 1938]. Thus it was a personal letter and a commitment from an institution, and not one of the organized committees, that initially brought Artin to America.[4] In Artin's life, the short-term position at Notre Dame served more as a starting point, an opportunity for steady income in that critical first year in a foreign country.

Artin moved from Notre Dame to Indiana University in 1938 where he remained until 1946. At that time, he joined the Princeton faculty. He returned to Germany in 1958 and died at the age of 64 on 20 December 1962. On this occasion of the fiftieth anniversary of his death, we highlight the years Artin spent in America and some of his contributions. Figure 1 and the cover of this issue feature the critical letter from Lefschetz to O'Hara [LH].

2. University of Notre Dame

At the University of Notre Dame, Father O'Hara established graduate education as one of two main priorities when he became president in 1934.[5] Father O'Hara believed in the work of research, but he needed funds. He made a point to raise money precisely for this cause. In the late 1920s and early 1930s, students at Notre Dame could pursue graduate work in chemistry, metallurgy, and biology on a sort

[3]Discouraged by the "efficacy" (or, lack thereof) of the organized committees to aid refugees, Harlow Shapley, Oswald Veblen, and Hermann Weyl adopted this strategy of appealing directly to an academic institution on behalf of a particular scholar in the late 1930s [21, pp. 151–153].

[4]The work of these committees has been examined elsewhere in more general works such as [21] and [20]. Karin Reich suggests Richard Courant played a key role in securing the job for Artin at Notre Dame. The Artins stayed with the Courant family in New York when they arrived by ship on 1 October 1937 [19, p. 80]. However, the Artin File in the Notre Dame Archives and the Lefschetz File in the Princeton Archives do not contain any correspondence from Courant concerning Artin.

[5]For the development of the graduate programs at Notre Dame in the late 1930s, see [14].

of *ad hoc* basis. In 1933, however, the university made a decided effort to follow the trend in American education and invest in staff and facilities for doctoral programs in philosophy, physics, mathematics, and politics. In 1938, the Department of Mathematics began to offer courses leading to the doctorate. Notre Dame recruited Karl Menger, then 36 years old, a former professor of mathematics at the University of Vienna and an influential member of the Vienna Circle, to launch this initiative; see [14], [11].[6] Menger was joined by Arthur Milgram, Paul Pepper, John Kelly, and, most important to our story, Emil Artin. Menger remained at Notre Dame until 1946 when he accepted a position at Illinois Institute for Technology.

Following the tradition of the Mathematical Colloquium that Menger had organized in Vienna—and its subsequent publication—he instituted a similar arrangement at Notre Dame. The Notre Dame colloquium, and its associated publication as the *Reports of a Mathematical Colloquium, Second Series*, extended from 1938 to 1946 when WWII interfered with academic life in America (the final published issue appeared in 1948). Menger also founded the series *Notre Dame Mathematical Lectures*, of which Number 2, Artin's *Galois Theory* [1], is the most widely known; see [11, p. xii]. This publication grew out of Artin's lectures on Galois theory at Notre Dame and was published in honor of the centenary celebration of Notre Dame in 1942.[7] Thus Notre Dame made another significant contribution to the development of mathematics: the university published mathematical treatises of a high level. Not only did Notre Dame begin to embrace and include research in its mathematics department, but it also relieved, ever so slightly, the growing need for the publication of advanced mathematics in America.

3. Indiana University

Naturally, news of Artin's arrival at Notre Dame spread quickly among mathematicians. In particular, the chair of the mathematics department at Indiana University in Bloomington (some 174 miles south of Notre Dame) recognized the value Artin could bring to their program. "It seems to me that departments should be strengthened from time to time as occasion offers", K. P. Williams wrote to his Dean. "There is the opportunity to strengthen this one.... There is Professor Artin at Notre Dame, almost on our doorstep, perhaps the leading man in algebra in the world, and one of the outstanding mathematicians of all fields" [WP, Williams to Payne, 6 April 1938]. Williams must have made a convincing case since Indiana University offered Artin a permanent faculty position to begin the following academic year (1938–1939). Thus Artin joined the faculty at both Notre

[6]Menger had attended and served as vice president of the International Congress of Mathematicians in Oslo in 1936. Friends and associates urged him to leave Austria and, with Notre Dame ready to develop their graduate program, he secured a professorship there beginning February 1937.

[7]Abraham Wald's *On the Principles of Statistical Inference* was the first book in the Notre Dame Mathematical Lecture Series. Kurt Gödel's lectures on logic in the spring of 1938 were to form the Number 3 volume in the series. The increased workload for mathematicians to train Naval officers at Notre Dame along with the substantial editing that would have been required on the part of Gödel ultimately combined to prevent the publication of this Number 3; see [16, pp. 225–226]. Koehler's article, written with some contributions from Menger, recounts the considerable effort of Menger to bring Gödel to Notre Dame for a semester. Karl Menger's *Algebra of Analysis* appeared as the Number 3 volume in the *Notre Dame Mathematical Lecture Series* and seven other volumes followed. For a complete list, see "Miscellaneous back pages," *Notre Dame Journal of Formal Logic*, 8 (1967): 1–2.

Dame and Indiana at critical times of transition in their mathematics programs [9]. In his seven years at Indiana, Artin oversaw the work of two Ph.D. students, David Gilbarg and Margaret Matchett (later Mrs. Stump); see [10], [18]. While at Indiana, Artin taught three classes each semester plus the graduate seminar, which he held on Monday or Tuesday evenings, depending on the term. He taught across the mathematics curriculum. In the fall of 1940, for example, Artin taught[8]

- Math 210a, Advanced Calculus,
- Math 357a, Relativity,
- Math 334a, Algebra and Number Theory,
- Math 322, Graduate Seminar.

In the spring of 1945, he taught

- Math 103a, Trigonometry,
- Math 210b, Advanced Calculus,
- Math 213, Differential Equations,
- Math 322, Graduate Seminar.

The structure of this teaching load combined with the security of a permanent position at the University of Indiana allowed Artin to gradually resume his mathematical research.[9] After a very active decade from 1921–1931 where "Artin's life had seen an activity not often equalled in the life of a mathematician" [5, p. 36], the next ten years of Artin's life were relatively quiet in terms of publications. In fact, from 1933 to 1940, Artin did not publish at all. The topics Artin suggested to his graduate students and his young collaborator, George Whaples, indicate that, although he had taken a bit of a hiatus from publishing mathematics, he had remained keenly aware of developments in his fields of interest. Artin, for example, was familiar with the new concept of idéles, introduced by Chevalley in 1936, and the critical turn that class field theory had taken as a consequence of this new approach; see [7], [8]. This global point of view provided the framework for Artin's fundamental work with George Whaples. In their joint work, they gave an axiomatic characterization of fields by the product formula for valuations. Together, they introduced the notion of valuation vectors, the additive counterpart of the idéles [3], [4].

Margaret Matchett, Artin's second graduate student at Indiana, submitted her thesis "On the zeta function for idéles" in 1946 [18]. There, she redefined classical zeta functions in terms of integrals over the idéle space and introduced some measure on this space. She interpreted the characters of Hecke, introduced in his seminal work "Eine neue Art von Zetafunktionen" in 1920 (see [12], [13]) as exactly those characters of the ideal group of the underlying number field that could be derived from idéle characters. She did not, however, succeed in proving the functional equation for the zeta functions. She never published her thesis, a fact that "annoyed" Artin [17]. A later student of Artin, John Tate, in his 1950 Princeton thesis, "Fourier analysis in number fields and Hecke's zeta functions", would bring this general program of transferring the theory of zeta functions into the idélic framework to complete fruition [22].

[8]These lists were compiled from [LR, Schedule of Lectures and Recitations].

[9]With the move to Bloomington, as Karin Tate, Artin's daughter, recalled many years later, "they resumed the active social life they had enjoyed in Hamburg, counting among their friends people from many departments at the university. The children took up instruments and Ma continued his mathematical pursuits" [23].

4. Princeton University

Artin moved from Indiana to Princeton University in 1946. This new opportunity changed his mathematical profile.

We can only suggest some possibilities as to how and why Artin made this transition from Indiana to Princeton. In 1945, Joseph Henry Maclagen Wedderburn's retirement opened a position in algebra at Princeton. In addition, Solomon Lefschetz, who had initially encouraged Notre Dame to make a place on their faculty for Artin in 1937, had assumed the chairmanship of the Princeton mathematics department in 1945. Finally, and perhaps most importantly, from his position at the nearby Institute for Advanced Study, Hermann Weyl could suggest—and support—Artin for a faculty appointment.[10] Perhaps Weyl offered Princeton an assessment of Artin that was similar to what he gave Syracuse in 1945. "When I left Zürich in 1930," Weyl wrote

> ... and again when I handed in my resignation at Göttingen in 1933, Artin's name was the very first which I suggested as a successor. This tells you clearly what my opinion of him is. Indeed, I look upon his early work in algebra and number theory as one of the few big mathematical events I have witnessed in my lifetime. A genius, aglow with the fire of ideas—that was the impression he gave in those years. Later, especially since the fateful year 1933, he had undoubtedly been less productive, but it is very likely that he will continue for considerable time to come to produce first rate mathematical work. He is an enthusiastic and exceptionally inspiring teacher. This quality is as strong in him now as it was in his youth. He has kept abreast of all important developments in mathematics, and in his seminars, through lively discussions and common labor of the whole group, he tries to penetrate into the secret of the underlying ideas, and to give them their simplest expression [WM, Weyl to Martin, 15 January 1945].

Thus Weyl promoted a balanced, well-rounded view of Artin that avoided a count of papers or students and emphasized his intrinsic ability as a creative researcher and teacher. It seems reasonable to conclude that the position made available by Wedderburn's retirement, along with the unique perspective Weyl could offer about Artin, combined to create the chance for Artin to join the Princeton faculty in 1946. Chevalley would also be close by, at Princeton University, if only for another year.

The Princeton opportunity seemed to revitalize Artin. His "exceptionally inspiring" teaching manifested itself in the form of eighteen doctoral students, including John Tate and Serge Lang. He had indeed kept abreast of all the important developments in mathematics and involved himself in a research program of algebra, number theory, and topology.

Artin advanced at Princeton, holding positions as Professor of Mathematics (1946–1948), Dod Professor of Mathematics (1948–1953), and, finally, Henry B. Fine Professor of Mathematics (1953–1959). That Artin was awarded the Fine Professorship stands as a testimony to the success he achieved in America. Only

[10] As [21] makes clear, Weyl worked tirelessly to bring displaced German scholars to the United States. He "spearheaded attempts to incorporate more refugees in the mathematics program" at the Institute for Advanced Study in Princeton, where he had come in 1933 [21, p. 150].

Oswald Veblen and Solomon Lefschetz, two cornerstones of the Princeton mathematics department and American mathematics as a whole, had held this position since the time of its inception in 1926.

Artin's response to his appointment to the Fine Chair underscores his deep commitment to and love of teaching. When A. W. Tucker, then chair of the Princeton Department of Mathematics, informed Artin of his selection as the next Fine Chair of Mathematics, "[i]nstead of looking delighted, Artin looked concerned." Indeed, Artin initially declined the position because "the Fine Chair does no teaching. I will not give up my freshman calculus course and so I must respectfully decline the honor." Apparently Tucker consulted with university lawyers about the exact terms of the Fine endowment and they determined that voluntary teaching was permissible. With that issue resolved, Artin accepted the Fine Chair.[11]

This distinguished position was not enough to keep Artin in America though. In the mid-1950s, Artin began to give serious thought to the possibility of returning to Germany. Initially, this desire to return to his homeland took the form of a sabbatical to the Universities of Göttingen and Hamburg during the 1956–1957 academic year. It was during this year, apparently, that Artin reached the decision to return to Germany on a more permanent basis [5, p. 28].

Artin returned to Princeton the following year and then requested a leave of absence for the 1958–1959 academic year. As Tucker, still chairman of the mathematics department, described it to Dean J. Douglas Brown, Artin

> ... plans to spend [the year] at the University of Hamburg, which still carries him as a nominal member of its Department of Mathematics (where he taught for many years before coming to the United States at the beginning of World War II).
>
> You will recall that we discussed this possible leave of absence for Professor Artin some time ago and you had indicated that the University could deal quite flexibly with Professor Artin's problem of being torn between his old roots in Germany and his new ones in America [TP, Tucker to Brown, 6 April 1958].

Apparently prepared for this type of request, Princeton granted Artin a leave of absence for 1958–1959. Princeton did not, however, intend to extend this "flexible" arrangement indefinitely. While they were sympathetic to the struggle Artin faced with his old and new "roots", the Princeton Department of Mathematics ultimately had to keep their own graduate program "on top". In July 1958, the administrators at Princeton realized "there is real likelihood that Artin will want to return to Germany permanently" [BG, Brown to Goheen, 3 July 1958]. Dean Brown offered his own view of what Artin faced, both professionally and personally.

> ... In Germany, Artin is given the "red carpet" treatment to an extent unknown in America whereas in the U.S. he is an "older" mathematician facing vigorous competition from a brilliant younger generation. He has eight years to go. Also, he and Mrs. Artin are separating because of Artin's love for Germany and Mrs. Artin's bitterness for Germany because of its treatment of her Jewish co-religionists....

[11] (http://www.ams.sunysb.edu/∼tucker/AWTvignettes.html) Tucker was aware of Artin's prowess in the classroom. When prospective students visited Princeton, Tucker used Artin's classroom lectures as a way to "show off" the department.

> We have given Artin a year's leave without pay to accept a visiting professorship in Germany. Tucker feels we should ask Artin about his plans by early spring. A suggestion to alternate between the U.S. and Germany would be impractical from Princeton's point of view since continuity is important in building the graduate program.
>
> Tucker's proposal is to recommend [John] Tate, now at Harvard.... [BG, Brown to Goheen, 3 July 1958].

Apparently, the demise of his marriage in America, his successful return to Germany in the 1956–1957 and 1958–1959 academic years, and, perhaps, other factors, came together in such a way that Artin submitted his resignation on 15 March 1959 [AG, Artin to Goheen, 15 March 1959].

5. Concluding thoughts

In the 1930s Artin was not completely free to make all of the choices about how to invest his mathematical energies. Artin had given thought to leaving Germany as early as the fall of 1934 [19, p. 76]. At the same time, Harald Nehrkorn, Hans Zassenhaus, and five other students earned their Ph.D.s under Artin's direction between 1933 and 1936.

In 1936, Artin and his colleagues, Erich Hecke and Wilhelm Blaschke, were scheduled to attend the International Congress of Mathematicians in Oslo, Norway. In the end, the German government allowed Hecke and Blaschke to attend the meeting but not Artin. In early 1937, the German government denied Artin permission to give a series of lectures at Stanford University in the summer of that year. Lefschetz was already working to secure a position for Artin in America as these events unfolded in Germany. The opportunity at Notre Dame came, literally, at just the right moment. On 27 July 1937, the Reichsstatthalter assigned Artin to the "Ruhestand", or involuntary retirement, effective 31 October 1937 [19, pp. 78–79]. By 1 October 1937, however, Artin had already made his way to America. If it truly was only a "question of time" until Artin would leave Germany, then the time had come [5, p. 28].

Thinking more broadly, in Nathan Reingold's "account of how the American mathematical community received and absorbed their overseas colleagues" up to the time the U.S. entered the war, he describes the actions of the American mathematicians as a consequence of many factors, including "... the influence of the ideology of the universality of science; of the hazards of Depression conditions; of the reactions to the policies of Nazi Germany; of the influence of nationalistic and anti-Semitic feelings in the United States; and of the persistence of the image of the United States as a haven for the oppressed. It is a story of a real world far removed from the certainty and elegance of mathematics as a monument to human rationality" [20, p. 314]. But there was something more. The reception of Emil Artin in America initially hinged on the expansion and improvement of mathematics departments, particularly at less elite universities, including, as in the case of Notre Dame, the addition of a graduate program. Thus, while Artin had made his own decision to depart Germany for America, it was a time of transition in American mathematics that helped open the door for Artin to segue into the mathematical community. The "for America" cannot be overstated. Had a similar political

situation occurred even forty years earlier, a mathematical research *community* in America would not have existed for Artin to emigrate *to*.

Artin and his students thrived. What he relinquished in Germany in the mid-1930s, he created again, gradually, during his time in America. The visible, nearly tangible, intellectual strength Artin brought to Chevalley's thesis via his lectures on class field theory in Hamburg in 1931 (see [15, p. 52]) transformed, over time, and amidst a myriad of unimaginable obstacles, into a similarly vibrant form in Tate's thesis. Along the way, other official and "un-"official students benefited from Artin's extraordinary prowess at engaging young people in pursuit of mathematics, of creating mathematicians in the midst of creating mathematical theories [5, p. 39].

Artin's time in America shows a beautiful blend of teaching and research, of old and new colleagues, and of a shared commitment to a mathematical community. Then as now, Artin's life stands as a testimony of the human spirit and, closer to home in the contemporary mathematical community, provides a more expanded view of how to measure the contributions and successes of a mathematician.

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