George David Birkhoff (1884-1944): Dutch-American Mathematician Extraordinaire

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Picture of George David Birkhoff in 1913, around the time he published his proof of Poincare s last geometric lemma.

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George David Birkhoff is America s premier mathematician of the first half of the twentieth century. His alma mater, the Illinois Institute of Technology, notes that this mathematical wonder & was said by many to have been the greatest mathematician in the world at the time of his death. [1] Birkhoff is included in every listing of great mathematicians of all times and places, and yet no Dutch American book of notables gives him any mention whatsoever. This paper seeks to redress that oversight by recounting the life and career of this famous second generation Dutch scientist.

Birkhoff's Biography

Birkhoff hailed from a notable and close-knit immigrant family, many of whom were singularly accomplished in their own ways. Grandfather George Birkhoff, Sr., a carpenter, immigrated in 1869 from Ooltgensplaat, Zuid Holland, to Chicago with his wife and seven children. Here his oldest son, George Jr., became the well-known Dutch consul, and another son David, became a physician. This medical doctor was George David s father. The maternal family, by the name Droppers, had arrived one generation earlier from Winterswijk in Gelderland in 1847, when the nineteenth century immigration from the Netherlands to the United States started in earnest. George David s mother, Janna Geertruida Droppers, was born in Wisconsin in 1862.[2] Some more background material on both families is given in the Appendix.

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[1] Quoted in Illinois Institute of Technology web page. Ralph Haan (Herrick Library, Holland Michigan), Robert P. Swierenga (A.C. van Raalte Institute, Holland Michigan), Arie Van den Dool (Schoonhoven) are acknowledged for their input. David Rodenhuis and Robert Swierenga read the manuscript and suggested many improvements. I also thank Åke Johansson and Jeff Anderson for their comments.

[2] A very important source is a Birkhoff family history written from memory by George Sr. in 1910, which he dedicated, interestingly, to his grandson George David Birkhoff, who, he said, inquired often after the family history. There is no such source for the Droppers family, so here we have less to report.

The Birkhoff family was not one of the masses of kleine luiden that populated the Dutch settlements in North America. From the outset, they resided in the emerging metropolis of Chicago and acted as an ambitious group with an eye for achievement and leadership. The Birkhoffs were a typical urban emigrant family who settled and flourished in the new land. That the progenitor chose to settle in Chicago was not obvious, given the family s rural background in the Netherlands.

Doctor Birkhoff left Chicago in about 1880 for six years after buying a medical practice, first in Oostburg Wisconsin (where he met his wife to be), then in Overisel, Michigan, a small village in the midst of the Rev. Albertus C. Van Raalte s Dutch colony of Holland. Here the two oldest children, George David (b 21 March, 1884) and Louisa Marie (b 1886), were born before the family returned to Chicago in 1886. So the little village of Overisel, which was a true replica of the mother country, played a very incidental role in George David's life.

Birkhoff married Margaret Elizabeth Grafius on September 2, 1908 in Chicago. They likely met as fellow students at the Lewis Institute. Margaret was born on March, 24, 1884 in Chicago as the daughter of William Grafius of New York and Louis Ebinge. The marriage took place in the Congregational Church at Leavitt and Adams Streets. Margaret received a bachelor s degree in Library Science in 1905 from the University of Illinois. The couple lived most of their lives in Cambridge, Massachusetts. They raised three children--Barbara (1909-), Garrett (1911-1996), and Rodney. Birkhoff died in Cambridge on November 12, 1944, at 60 years of age, after suffering from failing health for some years.

As a prototypical Dutch American, Birkhoff offers an interesting example of how hyphenates coped with and adjusted to the American scene and succeeded outside their ethnic group. Unlike, for example, the Dutch-born scientists Samuel A. Goudsmit and George E. Uhlenbeck, who had already established their international reputations before relocating to the United States, Birkhoff, son of an immigrant, was a real American by anybody s definition, although he inherited the baggage of his well-identified ethnic group.

This review of George David s career will establish his main contributions to mathematics and science, insofar as they can be explained to a general readership. There are numerous articles and books about Birkhoff s work, such as a three-volume, one thousand page collected works published six years after his death.[3] His fame lives on, and currently may even be increasing, many decades after his birth. One hundred years after his birth, in 1984, scientists honored him by organizing a conference.[4] The scientific treatises on Birkhoff's ideas contain very little biographical and personal information. Hence, although his Dutch American roots are of interest, we know very little about how, if any, this heritage influenced his life and work.

Birkhoff's Career

In this core section we discuss Birkhoff s education, career, main contributions to mathematics, some peculiarities about his career and the age he lived in, a list of academic prizes and scholarships and scientific notions named after him.

Birkhoff was a student at the Lewis Institute (later Illinois Institute) of Technology in Chicago from 1896 to 1902. He then entered the University of Chicago in 1902, but moved to Harvard already in 1903, where he was awarded the B.A. (1905) and M.A. (1906). While in Harvard, he submitted his first paper in 1904, co-authored by Harry Vandiver at Princeton University, with whom he worked by correspondence. He began doctoral studies at the University of Chicago in 1905 and was awarded the Ph.D. summa cum laude in 1907. At Harvard and Chicago his advisors were Maxime Bocher (1867-1918) and Eliakim Moore (1862-1932), respectively. However, Birkhoff devoted much time to self-study; he took on the monumental task of reading all of Henri Poincaré s (1854-1912) works. Although they never met, Poincaré had a greater impact on Birkhoff s later work than any of his academic mentors,

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3 D.V. Widder, C.R. Adams, R. E. Langer, M. Morse, and M.H. Stone, eds., *Collected Mathematical Works of George David Birkhoff, 3 vols.* (Providence, RI, 1950);

4 S. Diner, D. Fargue and G. Luchak (eds), *DynamicalSsystems:Aa Renewal of Mechanism: Centennial of George David Birkhoff* (Singapore, 1986).

and this was the result of quiet, dedicated study. Birkhoff s first position was that of instructor at the University of Wisconsin at Madison (1907-09). Next, he became a preceptor in mathematics at Princeton University. In 1912 he accepted an assistant professorship at Harvard University, where he would work the rest of his life. He was promoted to professor in 1919 and was named Perkins Professor in 1932. In 1936 he became the dean for the faculty of Arts and Sciences. Professionally, he served as vice-president of the American Mathematical Society (AMS) in 1919, editor of the Transactions of the AMS from 1921 to 1924, AMS President in 1925-26, and President of the American Association for the Advancement of Science in 1937. This latter position is rarely held by a mathematician. In 1940 Birkhoff was nominated President of the International Mathematical Congress.

The list of honors Birkhoff received is too long to reproduce in detail. He received some fourteen honorary degrees, about five in the United States, and the rest abroad. He was elected to the National Academy of Sciences in about a dozen countries. According to his biographers, he worked tirelessly (the expression used was with religious devotion) to advance mathematics in the United States. His loyalty to Harvard for so long was accompanied by countless visiting faculty positions throughout the world, mainly Europe, but also some in South America.[5]

Birkhoff wrote five books and nearly two hundred articles, mainly single-authored. Among his books is a bestseller in teaching, entitled *Basic Geometry*, which he co-authored with Ralph Beatley. This highly recommended high-school text by two eminent scholars comes with a manual for teachers and an answer book. Despite his success as an author, comments on

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[5] The sources for the above are Marston Morse, G. D. Birkhoff, in *Dictionary of Scientific Biography*., 143-46 (1970, 1980); Edward P. Wilson, G. D. Birkhoff, Obituary in *Science*, 102 (1945): 578-580; Oswald Veblen, George David Birkhoff , 1884-1944, *Proc.Amer.Phil.Soc., Yearbook* 1946, pp279-285; re-published in 2001 as *Biographical Memoirs*, 80 by National Academy of Scineces and an excellent living document web page maintained at the School of Mathematics in Scotland is at http://www-groups.dcs.st-and.ac.uk/~history/Mathematicians/Birkhoff.html.

Birkhoff s teaching skills were varied and guarded, in sharp contrast to his son, Garrett Birkhoff, who was very patient, well prepared, and focused while teaching mathematics at Harvard.

Birkhoff as Mathematician

Birkhoff worked on a variety of different mathematical topics, ultimately applying himself to problems far afield. The subject of his main contributions is a question that appears to be answered differently as time goes on. My comments are partly motivated by my own background in atmospheric science, and by the sudden fame that Birkhoff obtained when chaos theory was discovered some twenty years ago. This is the only reason I even know about Birkhoff. (I did not realize instantly that Birkhoff was Dutch-American, because the name sounds German.)

Poincaré theorem. Some of the great mathematicians, including David Hilbert and Poincaré left for the next generation a list of problems they considered important and as yet unsolved. Young Birkhoff became instantly famous all over the world when in 1913 he proved Poincaré s last geometric lemma to the satisfaction of a critical audience. This must have been a boy s dream come true, to prove something that had been too difficult for the great master. The theorem had to do with fixed points, one of the classical topics in mathematics, for a torus being folded onto itself.

Ergodic theorem Birkhoff is best known for what is called the ergodic theorem. In a physical setting this means that one can learn about the governing process by measuring at one point for a long enough time, as opposed to having to measure everywhere (which is impossible anyway). The full scope may be difficult to explain, but he worked this out for the gas laws, known from ancient laboratory experiments, and connected them to more modern molecular theory. In the process he outdid many physicists who had struggled to make this connection formally. This is typical for Birkhoff s work. He made excursions into unfamiliar fields, seemingly without effort, and almost immediately appeared at the leading edge of these sciences. While doing this he

remained somewhat of an outsider in these applied fields, in part because he appeared to have the red pencil ready for anybody who did not meet the highest standards of mathematical acuity.

The four color problem. In the mid-nineteenth century a map-making clerk in England discovered that he could color any map in such a way that no two counties that shared a common border had the same color, if the map was colored with just four colors and no more. Why four? Would this be true for any imaginable configuration of counties? He could not find any counter examples, nor has anyone else since. So certain statements are empirically true, but can we prove them? Ever since, this has been a central problem in mathematics. Even today no solid proof exists, although many tried and occasionally a proof is presented that survives the relentless critique of the colleagues for a short while.

Birkhoff was attracted to this kind of problem. Although he did not solve it, he guided future attempts to prove the four-color problem by developing the idea of reducibility . Because we cannot consider explicitly an infinity of possibilities, Birkhoff showed how a certain set of problems for n counties can be reduced to another set of problems for n-1 counties. And so on to n-2, n-3 etc. If one can prove the lemma for a low value of n, everything else follows by induction. This principle is still used heavily. In 1976 two mathematicians reasoned that all possible maps can be reduced to about forty nine different types of configurations. They then used a computer to check all possibilities within these forty nine basic cases. The proof was rejected, in part because the use of computers--to check all possibilities by brute force--defies the standards for beauty of mathematical proof. More recent proofs still stand until further notice.

Beauty, aesthetics and harmony Mathematicians are often obsessed with beauty and the aesthetics of mathematical abstraction. Mathematical proof is beautiful if it is as short, as transparent and as thought provoking as possible. [6]If you have not done something in the simplest possible way, you have not really understood the problem at all. Usually this type of

[6] J.P. Van Bendegem, Schoonheid in de wiskunde (Beauty in Math): Birkhoff revisited," *Tijdschrift voor Filosofie* 60 (No.1, 1998): 106-30.

thought among mathematicians applies strictly to math itself, such as simple and transparent proof, but in Birkhoff s case he wondered about the beauty of objects of art, music, poetry etc. Why is it that people think something is beautiful or ugly?. Some of the pure math actually involves words like harmony , tones, overtones, sub-harmonics. He even took a year off to visit museums around the world so as to prepare himself thoroughly for a mathematician s view of aesthetics. His work on a quantitative measure for aesthetics is unique if for no other reason that nearly no one else has attempted a mathematical view of these subjects. And he even went on to ethics!

Relativity theory In 1921 Birkhoff taught a course at Harvard in relativity, a modern topic in physics which was in the lime-light (Einstein got the Nobel Prize that year, albeit for a different topic). Although the topic must have been new to Birkhoff (except for Poincaré writings on the matter), he was not intimidated by relativity, nor daunted by its complexity. Quite the contrary, he immediately tried to improve upon Einstein s mathematical approach, and for decades, was persistently vocal about the errors Einstein had allegedly made. In this respect he was like other mathematicians such as Hilbert who had stated that physics is too difficult to be left to the physicists.

Birkhoff published a much-quoted article on relativity in 1923. At stake were the correct transformations one has to make from curved space to rectangular coordinates. In the extreme this work applies to gravitational collapse, which much later found application in astronomical black holes. In the history of developing ideas about black holes, Birkhoff still gets prominent mention today.

Dynamical systems. In 1927 Birkhoff published his famous textbook on Dynamical Systems. It was republished several times. This work, more than any other, is building on Poincaré s ideas. The origin of these ideas lies in the motion of the heavenly bodies: the moon, earth, sun, planets, and how one explains their orbits. But the same equations apply to fluids. Mathematicians excel in simplifying these problems to just two or three bodies and then they explore every aspect of

theory under any imaginable circumstance. The greatest minds (Pierre-Simon Laplace!) had worked on this. Birkhoff was much impressed, in general, by classical problems. Systems with two and three degrees of freedom are the main topic in Birkhoff s book. Classically, the emphasis was on regular, self repeating and predictable solutions, like planets in an orbit. Many before Birkhoff, including Poincaré, shied away from non-periodic or somewhat irregular or strange and unpredictable solutions. But Birkhoff made note of this. Subsequently, his work on these irregularities was forgotten for fifty years and waiting for something to happen.

Chaos, weather and strange attractors

In review articles on atmospheric science one can nowadays read about Birkhoff.[7] This is rather stunning since Birkhoff never worked in this field. The way this came about is that Professor Edward Lorenz of the Meteorology Department at the Massachusetts Institute of Technology discovered by accident that when one calculates twice via computer a weather forecast from very slightly different initial conditions, the results can be very far apart after a few weeks. This characteristic of many natural systems is now called the limit of predictability resulting from sensitivity to details in the initial state. The flap of the wings of a butterfly prevents perfect weather forecasts.

In 1963 Lorenz showed that such behavior (a lack of predictability) already exists when he simplified the equations for weather forecasting to only three degrees of freedom. It took another fifteen years before a new generation of mathematicians took note of Lorenz s paper and developed the math for what is now called chaos. Upon further reflection, Lorenz came to the conclusion that the lectures given by Birkhoff, which Lorenz attended when he was a student in Mathematics at Harvard in the early 1940s, may have guided him in the correct analysis of his 1963 results, which anyone else might have thought of as a programming error. Reproducing one s results, suddenly, was no longer obvious!

[7] W. Lablans, De visie van Ed Lorenz op de voorspelbaarheid van het weer, *Meteorologica* 10 (No. 2, 2001): 25-31. F. Verhulst, De historische route naar chaos , *De vlinder van Lorenz* (ISBN 906834064 6;1990), edited by H. Tennekes, 15-33.

Textbooks on chaos theory now draw a line from Poincaré, via Birkhoff and Lorenz, to current mathematical experts. And as it turns out, a new discovery by David Ruelle and Floris Takens around 1980, the strange attractor, was not that new after all. Birkhoff is now credited for having displayed the first strange attractor. The way that chaos became a new science is a long story.[8] This type of fame could be temporary, of course; one hundred years from now scientists may exclude mention of anybody we now think of as famous. But for the time being, Birkhoff is famous in chaos theory, although, curiously, he would not know what we mean by the term today.

Birkhoff s Fame

Until 1900 any self-respecting American mathematician or scientist would seek his education, or at least part of it, abroad, typically in Europe. The general assumption was that the United States was a backwater in the fields of science and mathematics. Birkhoff did not study abroad and we do not know why. Because of his exceptional talent, he was living proof that since about 1910, mathematicians with education in America only could in fact make it to the top of international recognition.

Later on many people abroad simply assumed that Birkhoff had studied in France and was a student out of Poincaré s school - Birkhoff has also been called America s Poincaré. Some scientists, writers, or artists become famous for their work later in their lives or even after they die, after having struggled all their lives with little attention or a place at the table of intellectual recognition. Not Birkhoff. He became famous very early on; he won easy recognition and climbed a career ladder to remarkable heights. This was not a struggling genius that lacked recognition during his own lifetime. It is amazing what he achieved in a short life.

As late as the first half of the twentieth century, scientists felt they had to cover a wide scale of sciences. They were philosophers, mathematicians, and physicists, all at the same time. So while Birkhoff is clearly a mathematician, he paid attention to many other fields, and was

[8] James Gleick, *Chaos: Making a New Science*. (New York: Viking Penguin, 1987).

eager for a chance to make a contribution later in his career. Ultimately, he published on astronomy, gravity, relativity theory, and philosophical topics like beauty, which he tried to understand in terms of basic notions that came naturally to him as a mathematician. It is not yet clear whether any of his work outside mathematics is of enduring significance.

However, the most audacious foray Birkhoff made outside mathematics was to redo the theory of relativity. Mathematicians are obsessed with simplicity and elegance. If it is not done as simply as possible, one has failed in the eyes of peers. Birkhoff felt that way about Einstein s most famous work, particularly the use of curved coordinates, which was much criticized. Birkhoff essentially held the position that Einstein s theory of general relativity was less than helpful . To take on an icon like Einstein is a sign of great confidence on the part of Birkhoff, or was it simply egotistical foolishness? Possibly Birkhoff inherited an attitude from Poincaré who also held the point of view that Einstein was given too much credit.

Birkhoff Apellations

The name Birkhoff is connected to various scientific ideas and awards. A select list includes:

Birkhoff s Bagel. This is a catchy phrase to describe the first ever published strange attractor. This reference made the concept tangible, much like Lorenz s butterfly. [9]

Birkhoff s Crater. Birkhoff made contributions to astronomy that have been honored by naming a crater on the moon after him. Who could have imagined a Dutch American crater on the moon!

Birkhoff s Billiard. Mathematicians love well-posed but, as it often turns out, non-trivial problems. Among them the 2 or 3 or n body problems. Originally an astronomical problem, how do n heavenly bodies (like sun, planets, moons) move in space while attracting each other by gravity, but simplified to, for instance, the predictability of the position and speed of billiard balls on a table with certain properties.

Birkhoff Prize . Actually there are two, if not three, such prizes. The most famous is an American Mathematical Society award, a Birkhoff Award, established in 1967, currently $4000,

[9] See also Gleick .

awarded once every five years for original work in applied mathematics. The first money came from the Birkhoff family. Remarkably, one of the awardees in 1978 was Birkhoff s son, Garrett Birkhoff, himself a well known Harvard mathematician.

Birkhoff Essay. This is a writing award for students at Hope College in Holland, Michigan, which is awarded with a small monetary recognition, currently $75. The prize was established by George Birkhoff, Jr., in 1888. Initially, the essay had to be written in Dutch, then there was a period with two parallel Birkhoff essay prizes, one in Dutch and one in English. From 1914 on, English was the only language used. George Birkhoff, Jr., is said to have been a benefactor of the College.

David Birkhoff Window. A sign that charity was common in the Birkhoff family is demonstrated by a stained glass window (named David) in Hope Church in Holland, Michigan, donated by Mrs Louise Birkhoff Boers and family in 1924.

Birkhoff Aesthestics. The name Birkhoff is connected, like almost no other, to beauty and esthetics in mathematics and science. His equation describing the competing impact of order and complexity is applied to just about everything. I even found an attempt to analyze National Hockey League games in terms of what the public likes and why, following Birkhoff s esthetic measures.

A search on the Internet gives several more examples, such as the Birkhoff polytope, Birkhoff normal form, Birkhoff-von Neumann crossbar switches, Birkhoff interpolation (the title of a book published in 1985), Birkhoff theorem, Birkhoff rule, Birkhoff s house in Cambridge (a national landmark), Birkhoff-Roth equation, sub-Birkhoff logical equation, Poincaré-Birkhoff-Witt theorem, Birkhoff Mathematical Library at Harvard, Poincaré-Birkhoff fixed point theorem, Birkhoff bifurcation, Birkhoff effect, etc. Some of these expressions may refer to Garrett or someone else still, but the majority refer to George David Birkhoff.

Conclusion

The life and career of the famous Dutch-American mathematician, George David Birkhoff, was distinguished and astoundingly different from his countrymen who became farmers and small merchants, or even professors at small, church-affiliated colleges that are more typical of the Dutch immigrants and their descendents. Unlike many second-generation Hollanders, he adapted readily to America. His family s status and wealth certainly enabled him to study and follow scientific pursuits, instead of working on the truck or tending a store. He had an excellent mind for mathematics and science and got the best education his era had to offer. He also learned much from reading books, especially those by the prolific Poincaré. Birkhoff wrote his master's thesis quite independently. He was a nationalist in that he was religiously dedicated to promoting mathematics in the United States, and he witnessed the period in which mathematics in the US rose from obscurity to a world-class and respected profession. He personally rose to the forefront like no other, was recognized and awarded as a towering figure early in life, and assumed enormous power in academia. He was also a great internationalist with close connections all over the world. Birkhoff was not a closet mathematician working alone on esoteric theories. His biographers note that he was very social and not at all eccentric , which is, apparently, unusual for a genius. Much of his work remains relevant today decades after his death. One of his biographies has recently been republished by the National Academy of Sciences.

Where is the Dutch-American connection? Other than the name and the roots, there is little Dutch about Birkhoff. Without his grandfather s booklet we would have had little to say specifically about any Dutch or Dutch-American heritage. While his father and uncles were very accomplished also, they operated mainly among Dutch-Americans. It appears Birkhoff did not look back after he got started as an academic. He wrote his scientific articles in many languages, notably French, German, Spanish and, of course, English. Curiously, we have not found any papers in Dutch, although we assume Dutch was his mother tongue. Had his parents stayed longer in rural Michigan, his schooling would have started in Dutch. There were Dutch schools

in Chicago, but they were affiliated with the conservative Christian Reformed Church, a Dutch Reformed splinter body that the Birkhoffs eschewed; they belonged to the Reformed Church in America, the nation s oldest Protestant body, whose youth attended public schools. Nor is there any evidence or particular interest in anything Dutch or even of Dutch mathematicians. There were only several co-workers, Harry S. Vandiver (Princeton) and Edward Burr van Vleck (University of Wisconsin) with roots in colonial New Netherlands. Among his students was B. O. Koopman, the famous statistician. His contacts in Europe were most often followers of Poincaré. There are references in Birkhoff's work to L.E.J. Brouwer, his Netherlandic contemporary and a man considered the father of intuitive mathematics. But there is certainly no clannishness in these references. Even Birkhoff's writings about faith, beauty, freedom, and the mathematics of the good, contain no direct references to his upbringing in the Dutch Reformed Church. His marriage to Margaret Grafius also reveals a significant break with traditional Dutch Reformed life. One small story would note some interest by the mathematics department of the University of Amsterdam to bring Birkhoff in, probably in the 1920s. The real star in that department was Brouwer. Birkhoff may have entertained the idea of living in the Netherlands, but nothing came of it.

While writing a biography, even a short one, several questions haunt the author. Would the subject approve of what is written? Should the subject be considered a hero? Most of what we write paints Birkhoff as a great man. Perhaps as an antidote, let me note that Birkhoff was not uniformly popular, as we might expect. There were the normal rivalries and tensions among scientists with competitive and domineering egos. One biographer notes that his social/political views were detached from the world , an occasional source of misunderstanding. The web site maintained by the Mathematics Department of St. Andrews University in Scotland has just recently added a paragraph to the Birkhoff page noting a negative side of his character. Birkhoff (and 2 or 3 others) had such power that they had a virtual veto over every appointment in academic mathematics in the United States. In 1933 Einstein came to America. Sensing that

his European Jewish colleagues were in grave danger, Einstein tried to find jobs for his European colleagues. Apparently Birkhoff and some colleagues, who were looking after the prospects of their own students, were not enthusiastic to free up opportunities for these particular immigrants, quite possibly at the expense of qualified Americans. This reluctance induced Einstein, who may also have been irritated by Birkhoff s persistent professional criticism, to make a strongly-worded accusation of anti-Semitism against the Birkhoff group.

A full-length biography of George David Birkhoff is needed, beginning with the plethora of information in the extended obituaries and summaries of his work for encyclopedias by some ten different authors. This task awaits a mathematician with an interest in the history of the discipline. A thorough study of the Birkhoff archive, including private correspondence, is needed to complete the picture of his transition from Dutch ethnic to American scientist. The biography would also address Birkhoff s brand of nationalism and attitudes towards certain immigrants.

In spite of his nationalism Birkhoff was an internationalist, par excellence. (So much for contradictions.) He traveled frequently and knew colleagues everywhere on the planet. He was a visiting faculty and member of the National Academy of more than ten nations. Given his status and his international outlook, he was asked by the Rockefeller Education Institute to write a report on the status of mathematics in Europe in 1926. Birkhoff used the occasion to make the United States look quite good compared to Europe, which to be sure, was largely his own accomplishment. Times had changed, and tables had turned.

Clearly, this man with common roots rose far above any clan or tribal ties. He was not a hyphenated American at a time during the First World War when there was considerable pressure to be American and to suppress ones ethnic heritage. Birkhoff would have been a star in his field regardless of where he was born, given the right opportunities and at least minimal encouragement. Even Overisel, Michigan would do. Use of a search engine in 2002 reveals forty-seven mentions of Overisel on the Internet in connection with Birkhoff. We do not know

whether Birkhoff had any sentimental feelings towards the place where he was born, but he is, undoubtedly, Overisel s most famous son.

Appendix: A few background notes on the Birkhoff and Droppers family

For both the Birkhoff and Droppers families we consulted the usual official sources, i.e. migration lists, Census, Burgerlijke Stand etc. An extensive genealogy has been worked out for Droppers, along with most other emigrants from Winterswijk on a webpage out of the University of Twente. There is no formal genealogy for Birkhoff, as far as we can tell, but there is a most interesting write-up by George Sr about the family (Birkhoff 1910), back to 1650. And a good number of references to various Birkhoffs of note can be found in the literature, such as in van Hinte(1985) and Swierenga(2002). Here we summarize the information on the paternal and maternal family of George David Birkhoff from the moment they came to the US.

Greatgrandfather Garrit Jan Droppers, born Winterswijk 3 Jan 1792, emigrated from Winterswijk, Gelderland to Milwaukee, WI, USA in 1847, with his wife Janna Geertruid Vardink and 8 children. Garrit Jan was one of several Droppers who came from Winterswijk to the US, probably all closely connected relatives and having many duplicate first names. They were Gereformeerd according to the emigration lists (Swierenga 1983) which we assume means Afgescheiden. The Droppers were a confectioners family in Winterswijk, a profession they continued in Milwaukee. The progenitor Garrit Jan died 2 March1860. His son Jan Derk Droppers, born Winterswijk July, 24,1832, married in the US to Geertruida Boeijink, one year younger, (she died in 1880), who also had a Winterswijk background. Jan Derk and Geertruida had ten children, one of which was Janna Geertruida Droppers, mother of GD, born 8 March 1862 in Milwaukee. The reference for the above is http://www.twente.nl/~genealogy/emigration/winterswijk_emigrants.htm where material of some 25,000 people is developed. Janna Geertruida Droppers was renamed Jennie (or Jane) later in life. On his mother s side GD thus had great-grandparents in this country.

According to the emigration lists (Swierenga 1983) Gerrit Birkhoff (b Ooltgensplaat Zuid Holland 9 Sept 1827) emigrated from Rotterdam to the US in 1869 with his wife Agatha van Putten, and seven children (all born in Ooltgensplaat) with the stated destination of Chicago Illinois. Indeed, the 1870 Census (Swierenga 1987) shows the family with somewhat adjusted names (and unavoidable spelling errors) in Cook County, Chicago Township, Illinois. The children, Ruth Geris, Maatje, David, Willemina, Lijntje, Klaas and Cornelia (original names!) ranged from age 17 to 4 years old. The family had been fairly prosperous before, but when Gerrit took over the business from his deceased father in 1845 or so, a series of mishaps created much poverty. Also his private life was difficult. In desperation they made the radical choice of emigration. The beginnings in the US were very difficult. None of them knew a word of English. But within a few years they were back on their feet and quite wealthy. The conversion from Gerrit to George between 1870 and 1880 Census is worth noting. The oldest two sons, George jr and David would be well known in Chicago. Van Hinte(1985) gives high praise when he writes about George Sr.: He became a man of great standing...and was an honorary member of the Chicago Carpenters and Builders Union .

In the 1900 Census we find David Birkhoff, 43 years old, a physician, lives at 408 Marshfield Ave in Chicago, with his wife Jennie, and 6 children: George D (16), Louise M (14), John (12), David (8), Gertrude (6) and Edward R (1). The older two are born in Michigan, the rest in Illinois. One more child, Jeanne, was born later.

Birkhoff (1910) had high praise for all his children, but he ran nearly out of superlatives when he describes his oldest son, George Jr. Basically, this boy developed overnight into a first class businessman. Soon he was a real estate broker at one of the largest firms in Chicago. He was elected director and president of the local real estate board , and became the promoter of the Holland Building and Loan Association. His fame grew further when, in 1886, King Willem III of The Netherlands appointed him Consul of The Netherlands for five states in the US, a position he kept for almost 30 years. More can be found on George jr in Krabbendam(2003, see this volume).

Birkhoff (1910) states that David was extremely talented in many disciplines, including calculus, but that it was decided after lengthy deliberations that he should become a doctor. David finished his education at Rush Medical College in Chicago. According to his father he was the first Hollander to graduate from this great medical school. He landed his first job in Oostburg, Wisconsin, another Dutch enclave. He did well professionally, and,

equally important, he found his future wife, Janna Geertruida Droppers, in nearby Milwaukee - they married in 1883. David moved on quickly to another somewhat larger medical practice he bought in Overisel, MI. The two oldest children of David and Jennie were born in Overisel. But somehow Chicago remained a magnet for the now urbanite Birkhoffs, and David returned to the city in 1886 (Grondwet 1886). David became president of the West Side Doctors Association and was known for brilliant lectures. Unfortunately, David had a poor health and died in 1908 at the age of only 52.

References:

Anonymous, 1886: Article in De Grondwet, May 15, 1886.

Birkhoff, George Sr., 1910: A short history of The Family Birkhoff. 64 pages. Published privately. Available from Herrick Library in Holland Michigan.

Swierenga R. P., 1983: Dutch emigrants to the United States, South Africa, South America and Southeast Asia, 1835-1880: an alphabetical listing by household heads and independent persons. Scholarly Resources, Wilmington Delaware.

Swierenga, R. P., 1987: Dutch households in US population censuses, 1850, 1860, 1870: An alphabetical listing by household heads.

Swierenga, R. P., 2002: Dutch Chicago. A history of the Hollanders in the Windy City. 908 pages. Wm. Eerdmans, Publishing Co, Grand Rapids/Cambridge.

Hinte, J. van, 1928: Nederlanders in Amerika. P. Noordhoff, Groningen. A new edition in English appeared in 1985, edited by R. P. Swierenga.