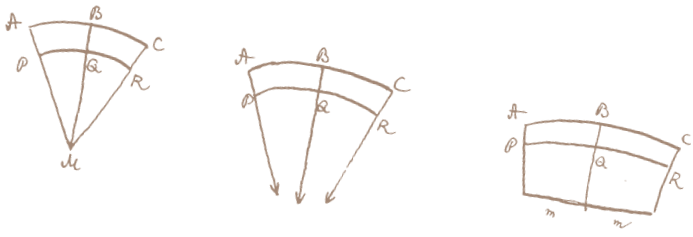
Edited by
Birgit Bergmann Moritz Epple Ruti Ungar

Transcending Tradition

Jewish Mathematicians in German-Speaking Academic Culture

Springer



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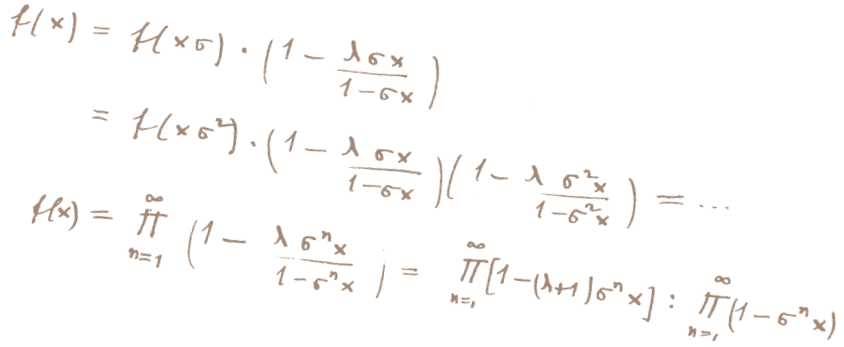

Editors
Birgit Bergmann
Moritz Epple
Ruti Ungar

Goethe-Universität Frankfurt am Main
Historisches Seminar
Wissenschaftsgeschichte
Grüneburgplatz 1
60323 Frankfurt am Main
Germany

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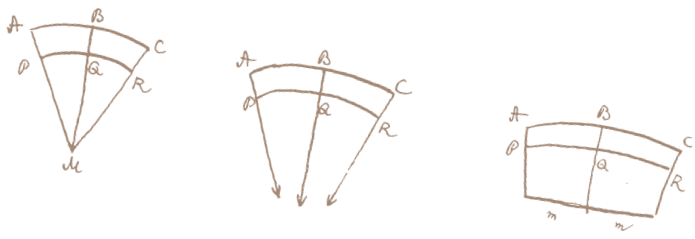

We dedicate this exhibition to
all the Jewish mathematicians, who could not flee
Germany in time after 1933.

$$f(x) = f(x\sigma)\cdot\left(1-\frac{\lambda\sigma x}{1-\sigma x}\right)$$

$$= f(x\sigma^2)\cdot\left(1-\frac{\lambda\sigma x}{1-\sigma x}\right)\left(1-\frac{\lambda\sigma^2 x}{1-\sigma^2 x}\right) = \dots$$

$$f(x) = \prod_{n=1}^{\infty}\left(1-\frac{\lambda\sigma^n x}{1-\sigma^n x}\right) = \prod_{n=1}^{\infty}[1-(\lambda+1)\sigma^n x] : \prod_{n=1}^{\infty}(1-\sigma^n x)$$


Jüdische Mathematiker
in der deutschsprachigen
akademischen Kultur

Preface

In the years after 1933, and occasionally even earlier, Jewish academics in Germany – and later in other countries occupied by German troops – lost their positions. Those who could not leave in time were sent to ghettos and deported to concentration camps. Some of those who managed to flee or to survive the camps were able to establish new careers in their host countries. Others, however, suffered greatly from the losses caused by their forced exile. Only very few returned to Germany following the end of the Nazi regime.

Mathematics was one of the sciences where the impact of Nazi persecution was strongest. For decades before their expulsion or extermination, Jewish mathematicians had become an important part of the German-speaking mathematical world. Advancement through education, the social trend so characteristic of German-Jewish life in the 19th and early 20th centuries, was highly successful in the field of mathematics. Even though discrimination and anti-Semitism never fully disappeared, the traditional barriers for Jews to enter universities began to weaken in the course of the 19th century, and a significant number of Jews undertook academic careers in mathematics. In the decades before and after 1900, when mathematics was undergoing a deep intellectual and professional transformation, many of them held professorships or other important positions in professional life. These mathematicians, therefore, were transcending tradition in at least two ways: they had overcome the long-lasting discrimination against Jewish scholars, and in a joint effort with their non-Jewish colleagues, they contributed to the process of modernization that was restructuring their field.

This exhibition aims to showcase the impressive technical and professional scope of this contribution. It concentrates on the period in which Jewish mathematicians in German-speaking countries achieved their most prominent successes: between the legal and political emancipation of German Jews in the 19th century and the Nazi years. For pragmatic reasons, the exhibition focuses on Germany, though much could be added for Austria and Switzerland. The exhibition highlights two points in particular. First, there was no part of the academic culture of mathematics during the period in question in which Jewish mathematicians were not actively involved. In the German Empire and the Weimar Republic, Jewish mathematicians worked in research, teaching, and publishing, they were active in professional organizations like the German Mathematical Society, and they participated in the public discourse on mathematics. They contributed to shaping the German-speaking mathematical culture of their time. Second, their activities were so varied and multifaceted that any stereotype of a “Jewish” style in mathematics can be immediately dismissed.

Still, it is impossible to consider these achievements without calling to mind what was to follow: the ousting, expulsion and persecution of Jewish colleagues. These crimes have been thoroughly researched by Reinhard Siegmund-Schultze and others, and they were the subject of an exhibition at the 1998 International Congress of Mathematicians in Berlin. Moreover, it is important to understand the achievements of Jewish mathematicians within the context of the segregation and discrimination that had been part of the daily lives of Jews for centuries. When seen in this perspective, the short period of flourishing cooperation between Jewish and

non-Jewish mathematicians in Germany before 1933 testifies to the great, and in some cases even surprising possibilities that open up when discrimination against a minority disappears. Throughout its history, mathematics has more than once demonstrated its potential to cross cultural borders – and the story told here is another case in point. It also shows the enormous damage done when hatred and discrimination threaten the lives of those who had been, and could still have been, crucial members of a thriving scientific culture.

The exhibition team:

Birgit Bergmann
Moritz Epple
Walter Purkert
Volker R. Remmert
David E. Rowe
Erhard Scholz
Ruti Ungar
Annette Vogt

Foreword

Dear readers and visitors of the exhibition,

Shedding light on the life and works of Jewish mathematicians in Germany in the 19th and early 20th centuries is an important and challenging task. Professor Moritz Epple and his team have done an excellent job of presenting this important subject in a manner which is both sensitive and compelling, not only for exhibition visitors interested in history or mathematics.

The documents gathered here vividly illustrate the crucial role played by Jewish scholars in all areas of mathematical life in the Wilhelmine Empire and the Weimar Republic: as researchers and scientists as well as teachers, journalists, and shapers of opinion. During the Weimar Republic, approximately one-third of the leading mathematicians in Germany were Jewish. Together with their non-Jewish colleagues, they helped bring outstanding international recognition and prestige to mathematical research and teaching in the German-speaking world. The Nazi rule put an end to this long phase of scientific prosperity. Jewish mathematicians were either forced to flee, or they were murdered. Part of the exhibition is devoted to this very destructive chapter in German scientific and cultural history.

Today in Germany, there is once again outstanding research being done in both pure and applied mathematics. That this has become possible is due, among other things, to the fact that mathematicians from many different countries live and work in Germany today, and that international cooperation is steadily increasing. The committed work of mathematicians in Germany and the achievements in modern mathematics received special attention in 2008, declared Jahr der Mathematik, a year devoted to the subject of mathematics, by the German government and the German Mathematical Society. The Deutsche Telekom Stiftung provided substantial support for events planned during this scientific year. Our goal as a foundation is to generate interest in mathematics and, in so doing, to show above all its importance and multifaceted nature as well as its historical development.

Providing support for this exhibition represented a particularly exciting opportunity for our foundation. I am convinced that it will contribute to open up new and expanded access to mathematics for many, and that it will help to further international cooperation and understanding in mathematics. Therefore, we are very happy that the support of the German Federal Ministry of Education and Research, of the Federal Foreign Office, and of the Ministry for Innovation, Science and Research of the State North Rhine-Westphalia has made it possible that the exhibition is now going abroad.

Dr. Klaus Kinkel
President, Deutsche Telekom Stiftung
Oktober 2011

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Introduction

Of the 94 full professorships in mathematics at German universities and institutes of higher education at the end of the Weimar Republic, twenty were held by Jewish mathematicians. Indeed if we consider the entire period between 1914 and 1933, as many as twenty-eight of these chairs were at least temporarily occupied by scholars who were Jewish or of Jewish descent. And although the exact number of Extraordinariate – paid or unpaid professorships of lower rank – is difficult to determine and was subject to constant fluctuation, we can assume that the percentage of Jewish mathematicians among them was similar. If we add to this the number of scholars who as a result of anti-Semitism or other factors were not permitted to submit a habilitation thesis and thus qualify for professorship, and if we keep in mind, too, the many Jewish mathematicians at German-speaking universities in Zurich, Vienna, Prague and other cities, it becomes clear that mathematical life in pre-1933 Germany and neighboring German-speaking countries was to a considerable extent a German-Jewish mathematical life.

Such was not always the case, nor was it equally true in all places. Before Jews obtained political and legal equality in Prussia and other German states in the course of the 19th century, there were no Jewish mathematicians at German-speaking universities and only a very few converts – despite the fact that Jewish scholars had been closely involved in the flourishing of mathematical sciences in medieval Europe, when the first great wave of translations of Greek and Arabic scientific texts reached Christian courts and universities. Moreover, Jews had been continuously involved in mathematics and related academic pursuits within their own culture – as the indefatigable Moritz Steinschneider amply demonstrated in the late 19th century. In spite of improvements, anti-Judaism and anti-Semitism also remained characteristic in both the Wilhelmine Empire (1871 – 1918) and the Weimar Republic (1919-1933). In some German cities these sentiments remained so strong that Jewish mathematicians could still not manage to gain a foothold in academic life even after Jews had achieved legal and political equality. In other cities, however, particularly those where Jewish life had been able to develop with fewer constraints after the mid-19th century, mathematicians from Jewish families managed to achieve remarkable academic success – not only in the great centers of German-language mathematics like Berlin and Gottingen, but also in certain liberal cities such as Frankfurt, Bonn or Heidelberg. During the Weimar Republic, institutes of mathematics in these cities were run almost exclusively by Jewish mathematicians.

Not only the physical but also the intellectual landscape of German-language mathematics in the early 1930s would be impossible to imagine without German-Jewish mathematicians. Indeed, some fields of mathematics were completely transformed by their contributions. Number theory was reshaped by Hermann Minkowski and Edmund Landau, algebra by Ernst Steinitz and Emmy Noether, set theory and general topology by Felix Hausdorff, Abraham Fraenkel and several others – to mention but a few examples. In many rapidly expanding fields of modern mathematics, German-Jewish mathematicians contributed ground-breaking research – such as Adolf Hurwitz in function theory, Max Dehn in geometrical topology, or Paul Bernays in the foundations of mathematics. However, German-Jewish mathematicians did not limit their interest to 'pure mathematics'. Carl Gustav Jacobi made

B. Bergmann et al. (eds.), *Transcending Tradition*

major contributions to the theory of elliptical functions (a field already shaped by many other Jewish mathematicians in the 19th century: Ferdinand Gotthold Eisenstein, Leopold Kronecker, Leo Königsberger etc.) as well as to mechanics. Karl Schwarzschild's dissertation dealt with celestial mechanics, which later became an object of mathematical interest for Aurel Wintner. As an astronomer well-versed in mathematics, Schwarzschild also turned some of his attention to Einstein's relativity theory; similarly Emmy Noether and Jacob Grommer also contributed to the mathematical basis of Einstein's theory. Arthur Schoenflies and others brought the group-theoretical classification of crystal structures to a new level. Richard Courant and the young John von Neumann worked on new ways of presenting the methods of mathematical physics and, specifically, quantum theory. Applied mathematics, an expanding field at German institutions in the 1920s, owed much to the work of Richard von Mises, and the mathematical engineering sciences of hydrodynamics and aerodynamics to the contributions of Theodore von Kármán and Leon Lichtenstein.

A similar picture emerges for the professional infrastructure of mathematics and for the discipline's manifestation in broader culture. Whether it was Crelle's (later Borchardt's) *Journal für die reine und angewandte Mathematik,* the *Mathematische Annalen* or *Zeitschrift für angewandte Mathematik und Mechanik*, nearly all important journals had Jewish mathematicians on their editorial staff. Even the leading international mathematics publishing house, Julius Springer Verlag (whose founder was himself Jewish), profited substantially from its collaboration with Richard Courant and numerous Jewish authors. Jewish mathematicians were involved in the foundation of the *Deutsche Mathematiker-Vereinigung (DMV)* [German Mathematical Society] in 1890 as well as in setting up the *Gesellschaft für angewandte Mathematik und Mechanik (GAMM)* [Society for Applied Mathematics and Mechanics] in 1922. In many publications on academic culture for a general audience, and in all of the important debates on the role of mathematics in human culture, their voices carried well beyond the borders of their discipline.

These remarkable phenomena, described in detail in the exhibition, raise a number of interesting historical questions. How could this small section of the population achieve such academic success in just a few decades, despite all the lingering hostilities they faced? What role did Jewish mathematicians play in the rapid modernization of German-language mathematical culture that took place in the transition from the 19th to the 20th century? Why was there no substantial resistance to their expulsion initially from Germany and later from Europe, even from within their own discipline? How many of the mathematicians who had been forced to flee the Nazi regime returned to one of the two German states after the war?

The first question has been posed repeatedly since the early 20th century. The phenomenon has often been explained as a specific reaction to the social and cultural marginalization of Jews, as proposed by Thorstein Veblen's much-discussed hypothesis; more recently, other exceptional characteristics of German-Jewish academics have come to light which focus on particular paths toward qualification, a specific dynamic of cultural integration following political-legal equality, or even simply on the affinity of the cultural values of German-Jewish middle-class families to the values of scientific activity (cf. contributions by Volkov, Mosse and Charpa as listed in the bibliography). These answers have themselves raised new questions, and the discussion is not expected to end anytime soon. One of the specific

questions that remain is why Jewish scholars came to be so heavily involved in the field of mathematics in particular. To date there have been no detailed investigations on this topic (comparable, for example, to Ute Deichmann's study of chemists and biochemists). It might be that the international character of mathematics and certain discipline-specific components of its academic value structure – its strong research orientation and its implicit universalism – played a role, together with the fact that the career field for mathematicians underwent significant changes during the period examined by this exhibition, opening up an unusually large number of new opportunities.

The lack of recognizable resistance to the expulsion of Jewish colleagues and the difficulties attendant to their return are, by contrast, well-known – and not only in the field of mathematics. Reinhard Siegmund-Schultze's important book, *Mathematiker auf der Flucht vor Hitler* (1998) – meanwhile translated and revised under the title *Mathematicians Fleeing from Nazi Germany*: *Individual Fates and Global Impact* (2009) – describes the processes of persecution and emigration in detail, and our exhibition owes much to his work. Questions regarding the return of these mathematicians – attempts at remigration, failures and rare successes – as well as the resumption of professional and personal communication between émigré mathematicians and their German colleagues after 1945 still remain largely unanswered in historical research.

In whatever ways all these questions may finally be answered, we cannot deny the fact that the German-speaking mathematical culture of the Wilhelmine Empire and the Weimar Republic would have been inconceivable without the active contribution of Jewish mathematicians. By around 1900 at the latest, German-Jewish mathematicians were an essential and integral part of this culture, and both Jewish and non-Jewish colleagues worked together to advance their discipline in Germany. This remains true even if Jews were still discriminated as a minority in German society, and even if, in sociological terms, there was never a coherent group of German-Jewish mathematicians. Their scientific and academic backgrounds were too different, as were their cultural, political, and religious attitudes. Some openly and consciously adhered to Jewish cultural traditions while others (particularly during the Wilhelmine Empire) sought to integrate into German society and culture as completely as possible. Those scientists who distanced themselves from religious tradition as a result of legal requirements, continuing anti-Semitism or their own cosmopolitan viewpoint, sometimes entirely rejected their Jewishness, sometimes developed a new and fragile, secular-oriented Jewish identity as a reaction to the anti-Semitism that was gradually spreading across Europe.

Any attempt to describe the period stretching from the establishment of the Wilhelmine Empire to the beginning of the Nazi era as a history of 'German' mathematics without German-Jewish participation is, therefore, so excessively counterfactual that it is doomed to failure from the very beginning. And yet, after the Nazis' successes at the ballot box, all too many Germans energetically attempted to create facts out of counterfacts, turning into a reality something that had previously been almost inconceivable. At a striking pace, they marched towards the elimination of the Jewish component of German society and culture, even in the relatively limited and small science, profession and culture of mathematics. The results of this discontinuity can still be felt in today's mathematical culture in a variety of ways.

Perhaps now is the time to imagine an alternative course of the history of German-speaking mathematical culture, one that is contrary to the actual course of events. What would it have been like if the flourishing mathematical culture to which this exhibition is devoted had been allowed to continue in a world free of anti-Semitism and of the crimes against humanity committed by the Nazis and their followers?

The exhibition

The exhibition and catalogue are divided into ten sections. The first two sections provide a general introduction to the subject; the final three summarize the most important outcomes of the persecution, expulsion and emigration of the Jews in Germany, the few attempts at returning after 1945, and they commemorate the victims of the Holocaust. The other sections function for the most part independently and can be read in any order.

Section 1
From Exclusion to Acceptance, from Acceptance to Persecution

The first section begins with a brief overview of Jewish intellectual life before Jews were granted legal equality and emancipation in the 19th century. It also describes the role of Jewish mathematical scholars in earlier times, from their involvement in the translation of ancient works during the Middle Ages up to their first steps in the world of European universities. Next, the section summarizes the legal, political and cultural framework of Jewish life in Germany up to 1933.

The stages of emancipation and the career opportunities that opened up as a result are explored primarily for Prussia and later for the Wilhelmine Empire, as are the waves of anti-Semitism that ran through the late 19th and early 20th centuries. The concept of advancement through education, which characterized the cultural self-image of many middle-class German-Jewish families in the 19th century, provides an important context for the activity of Jewish scientists from the Wilhelmine Empire up to the Weimar Republic.

Section 2
People

This section presents general information on Jewish mathematicians in the Wilhelmine Empire and the Weimar Republic. Various charts and maps show all known Jewish mathematicians who regularly taught or did research at German universities, and the places of their professional activity. The section also provides an overview of how the presence of Jewish mathematicians at universities in the period of about 150 years covered by the exhibition changed as a result of their gradual emancipation, and how the emancipatory trend varied regionally. The material is expanded by an (incomplete) list of sources preserved in various German university archives in the appendix. The data presented here are based on primary research and provide the most comprehensive information available for the mathematicians of the period under review. A corresponding database in the internet version of the exhibition will be provided at a later date.

Section 3
Places

As Section 2 shows, Jewish mathematicians were not equally represented in all places. The particular character of a city – and the extent to which it allowed Jewish life to unfold – played an important role for Jewish citizens. Section 3, therefore, examines various places where Jewish mathematicians were involved in the mathematical culture of a city for an extended period of time. The cities covered in this section include the two large centers for German-speaking mathematics, Berlin and Göttingen, as well as other cities in which German-Jewish culture was particularly lively, such as Bonn and Frankfurt, the two cities selected here. For these places, the section also provides examples of how the Jewish mathematicians who lived and worked in a particular city were connected with the general culture of that city.

Since many of the mathematicians included here were professionally active at more than one location, several other cities are mentioned in this and other sections of the exhibition, among them Königsberg (now Kaliningrad), Zurich, Vienna, Munich and Heidelberg.

Section 4
Writings

This section presents a selection of about 50 monographs, influential textbooks and, in a few cases, collected works of Jewish mathematicians. The exhibited works can be leafed through and read by visitors to the exhibition. The books on display rank among the most important mathematical works of their time. In this catalogue you will find the title pages of these books accompanied by brief descriptions of their authors' contributions to mathematics.

Section 5
Professional Commitment

From the beginning, German-Jewish mathematicians were also involved in the organs of the mathematical profession: in the publication of journals, in collaborating with publishing houses, specifically the Springer Verlag, and in professional associations. This section reminds visitors of some of the personalities who left a significant imprint on the German-language mathematics publishing houses of the 19th and 20th centuries: Carl Wilhelm Borchardt, Leon Lichtenstein, Otto Blumenthal, Richard Courant and Richard von Mises. The section also illuminates the participation of Jewish mathematicians in the founding of the German Mathematical Society and the Society for Applied Mathematics and Mechanics.

Section 6
Mathematics in Culture

Jewish mathematicians were involved in making the intriguing questions of their discipline accessible to a larger public beyond the borders of their scientific community, and in explaining the role of mathematics in general culture. This section presents selected aspects of this engagement – from the controversy between Alfred Pringsheim and Felix Klein on the question of how modern university lectures in

analysis for beginners should be held to the widely disseminated popular texts written by German-Jewish authors and the taking of positions in the cultural debates of the Weimar period. Related material in Section 3 – Places – expands the subject matter of this section.

Section 7
Anti-Semitism

Animosity toward Jews, which for centuries had been part and parcel of Jewish history, did not disappear after they had been granted legal equality. Anti-Semitism was just as likely to be present in the academic world of the Wilhelmine Empire and the Weimar Republic as it was in general society. This section depicts, on the one hand, the everyday anti-Semitism of the time, which affected all Jewish mathematicians in the period under examination and was expressed in prejudices and stereotypes, but also – as several documents presented in this section make very clear – in university appointment policies. Many of the exhibits included here are published for the first time. On the other hand, this section evokes the dramatic development from anti-Semitic stereotypes to the Nazi obsession with race. This trend can also be traced in mathematical culture – in documents, texts and actions, and not least of all in pamphlets published by adherents of the so-called "Deutsche Mathematik".

Section 8
Dismissals and Exile

Section eight of the exhibition summarizes current knowledge about the persecution and expulsion of Jewish mathematicians that began in 1933. It recounts dismissals, emigration, flight and deaths. The manner in which the German Mathematical Society treated its Jewish members is also discussed. In the remainder of the section, the conditions encountered by refugees in their main countries of immigration are described briefly. Since all these topics can be no more than touched upon by the exhibition, the section also refers interested visitors to available sources and relevant research literature.

Section 9
Return? Jewish Émigré Mathematicians and Germany

This section addresses an issue which has received little attention in recent research, namely the possibilities – or in some cases the impossibility – for Jewish mathematicians to return to Germany after the downfall of the Nazi regime. In selected exhibits, it depicts the various, usually failed, efforts of Jewish mathematicians to return to Germany, as well as the few successful remigrations some years after the war. The section also illustrates some of the problems involved in reopening scientific communication between German mathematicians and the emigrants and their families in the years that followed the Holocaust.

Section 10
In Memoriam

The origins of the exhibition

This exhibition owes its existence to two independent impulses. First of all, some members of our team were confronted with the history of German-Jewish mathematicians while working on the edition of the *Collected Works* of the mathematician and writer Felix Hausdorff. This edition project, undertaken by the North Rhine-Westphalian Academy of Sciences and Humanities on the initiative of Egbert Brieskorn, raised questions concerning the general situation of German-Jewish mathematicians during the Wilhelmine Empire and the Weimar Republic. Was Hausdorff's impressive career a singular case? Did it follow typical career patterns, at least in some respects? To those involved in the project, the answer to both questions seemed to be yes. Yet, we noticed how little general historical literature there was on the activities of Jewish mathematicians in German-speaking academic culture. Considering that many of the leading German-speaking mathematicians of the late 19th and early 20th centuries came from Jewish families, this was quite surprising. Reinhard Siegmund-Schultze's monograph *Mathematicians Fleeing from Nazi Germany* had already comprehensively documented the flight and emigration of Jewish mathematicians from Germany and provided a basic summary of the known data about their persecution and deaths in Nazi Germany. Much less had been written on the life and work of German-Jewish mathematicians before 1933; a more thorough study of this period, therefore, appeared all the more important to us. Two students took the first steps in this direction. Helmut Berresheim began collecting certain data on German-Jewish mathematicians in the appendix to his Master's thesis on Hausdorff's work on divergent series, *Untersuchungen divergenter Reihen unter besonderer Berücksichtigung der Beiträge Felix Hausdorffs* (Bonn, 2002). Birgit Bergmann, in her Master's thesis, *Die Rolle jüdischer Mathematiker in der akademischen Öffentlichkeit in Deutschland von der 2. Hälfte des 19. Jahrhunderts bis zur Weimarer Republik* (Frankfurt/Main, 2006), on the role of Jewish mathematicians in the German academic public from the 2nd half of the 19th century to the Weimar Republic, systematically gathered information about Jewish mathematicians scattered in existing historical literature. She also analyzed their contributions to the debates on mathematics in the academic public of the Wilhelmine Empire and the Weimar Republic. Both theses underlined the strong commitment of German-Jewish mathematicians to the modernization of mathematics in this period, thus touching on the more general issue of the role of German Jews in cultural modernity, highlighted in work by Shulamith Volkov and others [see e.g. (Volkov 2006) and (Volkov 2000)].

Independently of this work, the Mathematical Institute at the University of Bonn suggested putting together an exhibition on the topic of Jewish mathematicians for the annual meeting of the German Mathematical Society in 2006. As the persecution and expulsion of Jewish mathematicians had previously been the subject of another exhibition – *Terror and Exile. Persecution and Expulsion of Mathematicians from Berlin between 1933 and 1945*, which was staged in Berlin in 1998 on the occasion of the first International Congress of Mathematicians to take place in Germany since 1904 – those responsible for Hausdorff's *Collected Works* suggested an exhibition focusing on the years before 1933. This idea converged with the work done in the studies mentioned in the last paragraph and thus found its way from the editorial office of the Hausdorff edition to the team which has put the present exhibition together.

A first version of the exhibition, displayed at Poppelsdorf Palace in Bonn in September 2006 for the annual meeting of the German Mathematical Society, was largely produced by the authors of this exhibition on their own. Geert Storbeck of the Bonn University Geographical Institute contributed the graphics and printed the original panels. The response to the exhibition was so positive that soon afterwards, in March 2007, it was put on display in the foyer of the Humboldt University in Berlin, this time on the occasion of the joint meeting of the German Mathematical Society and the German Society of Didactics of Mathematics.

In 2008, the Deutsche Telekom Stiftung provided financial support for a complete redesign of the exhibition. This second version (some photographs of it may be seen in this catalogue) traveled through Germany during the Year of Mathematics 2008 and has since been shown in many major German cities. The new concept and design were developed jointly with the Jewish Museum in Frankfurt and the company init: feil und partner, which took responsibility for both the design and the production of the new German version. In addition to the exhibition and catalogue, a German-English internet version can be found at *www.juedische-mathematiker.de*. It will be possible to update this internet version from time to time to present additional exhibits and materials on German-Jewish mathematicians.

The German version of the exhibition was well received in the cities in which it was shown. Many visitors of this second version as well as colleagues from several countries outside Germany raised the question of whether an international version of the exhibition might be feasible. With the support of three German ministries, the Federal Ministry for Education and Research, the Federal Foreign Office, and the Ministry of Science of North Rhine-Westphalia, an English version of the exhibition has now been produced. The exhibition has been re-designed once again, this time for an international public. The new design was developed by Atelier Markgraph, Frankfurt.

The topics dealt with in this exhibition are far from being exhausted. Much more, and more detailed, research into the role of Jewish mathematicians in German-speaking academic culture remains to be done. We hope that our exhibition can provide an interesting starting point.

Acknowledgements

First of all, we owe a debt of gratitude to the initiators and supporters of the various stages of our project. Among them are Werner Ballmann, organizer of the 2006 annual meeting of the German Mathematical Society in Bonn, Günter M. Ziegler, president of the German Mathematical Society and coordinator of the Year of Mathematics in 2008, Wolfgang Lück, president of the German Mathematical Society during the preparation of the international version, and Matthias Kreck, director of the Hausdorff Research Institute for Mathematics at this time. Matthias Kreck, Wolfgang Lück, and Günter M. Ziegler have also taken responsibility for planning an accompanying program of mathematical events during the first trip abroad, which will be to Israel in 2011 and early 2012. We are particularly grateful to Klaus Kinkel, president of Deutsche Telekom Stiftung, who has given strong support to our project from its first beginnings to the international version.

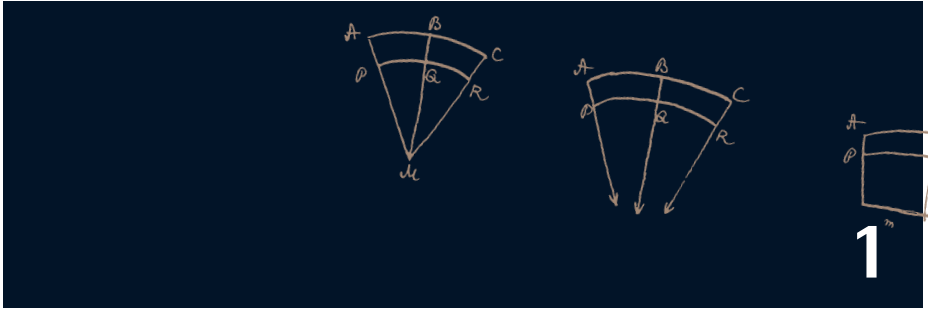
For scientific and curatorial advice given we are indebted to Ulrich Charpa (Leo Baeck Institute London), Reinhard Siegmund-Schultze (Agder College Kristiansand), Klaus Volkert (Cologne University), Ulf Hashagen (Deutsches Museum Munich), Michael Korey (Staatliche Kunstsammlungen Dresden), and Tzvi Langermann (Bar-Ilan University), as well as to Fritz Backhaus and Raphael Gross at the Jewish Museum Frankfurt.

Many of the photographs displayed in the exhibition come from two sources in particular: the George Pólya picture album, in the possession of Dr. Gerald L. Alexanderson, Santa Clara University, California, and the photographic collection of the Oberwolfach Mathematical Research Institute. We are greatly indebted to both for permission to use the photographs.

We owe particular thanks, furthermore, to the following archives and university libraries: Universitäts- und Landesbibliothek Bonn, Niedersächsische Staats- und Universitätsbibliothek Göttingen, Universitätsarchiv Freiburg, Archiv der Humboldt-Universität zu Berlin, Universitätsarchiv Frankfurt and Archiv des Springer Verlags Berlin. Early in the project, we wrote to all the archives of the German universities and mathematics institutes where the mathematicians listed in section two had been active, requesting information about archival materials on these individuals. We received many helpful answers. The information thus obtained is presented in the index of archival holdings at the end of this volume. We would like to thank all those who responded. For the exhibition's book display we gratefully acknowledge the friendly support of the antiquarian Gerhard Renner (Albstadt).

We must also thank Springer, the scientific publishing house, for kindly publishing the German and English versions of the exhibition catalogue, and in particular Joachim Heinze and Clemens Heine. Nicole Gentz has been extremely helpful in editing the English version of the catalogue, and we offer our sincere thanks for her patience and precision in revising both the text and the translations of documents shown in the exhibition. Finally, we owe a debt of gratitude to the secretaries and student assistants without whose active involvement this traveling exhibition could not have been realized. Those involved in various phases of the project include Uta Brucker and Judith Delombre in the secretariat of the History of Science group at Frankfurt University; Björn Buxbaum-Conradi, Lisa Haag, Martin Herrnstadt, Timotheus Kartmann, Dominik Kauss, Philipp Kranz, Iris Pfliegensdörfer, Amos Schindler, Dorothea Wolkenhauer (all from Frankfurt) and Frithjof Kurtz (in Bonn).

Moritz Epple



From Exclusion to Acceptance, from Acceptance to Persecution

The exhibition “Transcending Tradition: Jewish Mathematicians in the German-Speaking Academic Culture” illustrates the personal and professional lives of Jewish mathematicians, presenting typical places where they lived and worked and familiarizing visitors with their mathematical achievements, their books and publications, and their participation in professional organizations like the German Mathematical Society. Because of the long history of exclusion of Jewish scientists and mathematicians from the academic world, our overview does not begin until about 1820. Carl Gustav Jacob Jacobi (1804-1851) was the first Jewish mathematician to be granted a professorship at a German-speaking university. In 1827 he was appointed Extraordinarius and in 1832 full professor at the University of Königsberg (now Kaliningrad, Russia). He had, however, already converted to Christianity by the time these appointments were made. This essay will illustrate why conversion seemed to be necessary, why Jewish mathematicians did not begin to appear at German universities until after 1820, and what the general circumstances were for them in the German-speaking academic world. The essay will also describe the ongoing discrimination of Jewish university students. German universities were slow to open their doors to Jewish students, who even then remained confronted by the negative attitudes of Christian students, professors and officials and by the omnipresence of stereotypes and discrimination. Looking back, these decades of the mid-nineteenth century can be described as a period of transition from exclusion to acceptance, but nevertheless as a period in which discrimination never fully disappeared.

B. Bergmann et al. (eds.), *Transcending Tradition*

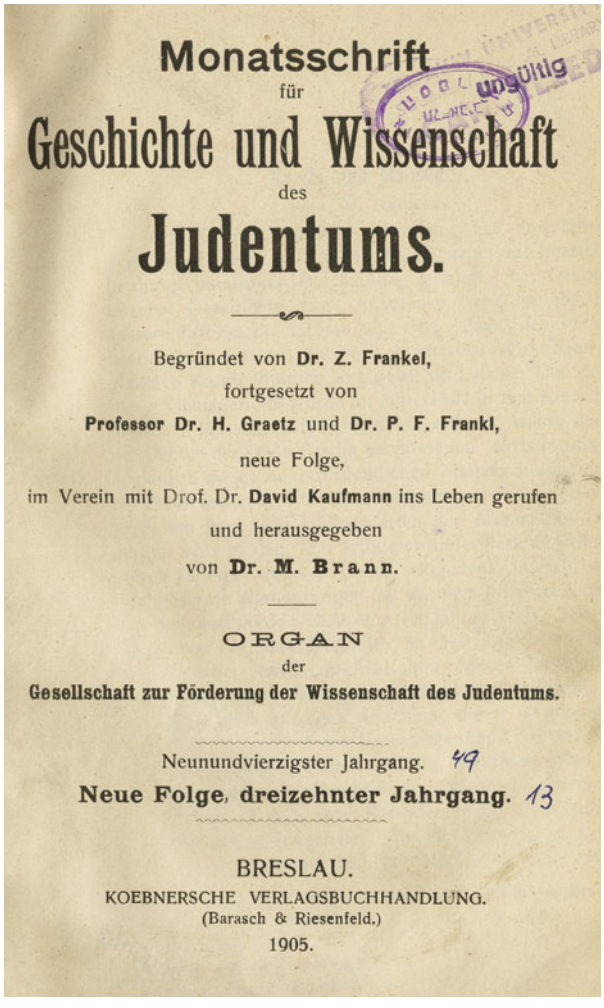
Moritz Steinschneider

Jewish mathematical life before emancipation

Our exhibition spans a time period of approximately 150 years, from the time of the French Revolution to 1945. There had, of course, been Jewish scholars in German-speaking areas who had been interested in mathematics hundreds of years before, indeed as long as they had been allowed to live there. Jewish mathematicians worked within their own communities, excluded from the academic world, hardly noticed, to say nothing of respected or acknowledged, until the universities began accepting Jewish students. In the late 19th century, when the Hebrew scholar and bibliographer Moritz Steinschneider (1816-1907) published several articles about mathematical research done by Jewish scholars from the time of the Talmud until 1787, these works were familiar only to a handful of specialists who were able to read Hebrew. For more than 50 years, Steinschneider had been collecting information about manuscripts and authors, overwhelmed by the wealth of material he wanted to describe and worried that he might not manage this task in his own lifetime.[1] Steinschneider also looked into the reasons for the interest of Jewish scholars in mathematics: "If Jews were seen to be involved in any intellectual pursuit which was not directly linked to the Bible or did not appear to be so, then it was thought necessary to trace this activity back to the only occupations which were permitted to the Jews in the Middle Ages (and indeed only in certain areas) ... namely trade, usury, and healing."[2] In the foreword to his collection of old manuscripts on mathematics, he answered this question in a different way, explaining: "It will be seen that the Jews preferred to focus on astronomy and the closely related field of astrology, the more distant disciplines of geometry and algebra, as well as arithmetic. When have the merchants and usurers of a nation been so bold as to tackle the most difficult problems of mathematics?!"[3]

A page from the "Epitome of the Almagest" by Ibn Rushd (Averroes). The Arabic original has been lost, and only the Hebrew translation survives.

Jewish mathematicians first appeared in the world of German-speaking universities around 1800. Until this time, Jewish mathematicians had debated, researched and published only in their Jewish communities - from Hamburg to Bavaria, from Vilnius to Cologne. The surrounding Christians often viewed them with hostility, or at the very least with suspicion.[4] Many Jewish thinkers and philosophers, physicians and alchemists, Talmudic scholars and rabbis as well as teachers at yeshivas and Talmudic schools dealt with mathematics as an integral part of their work, particularly if their scientific interests were closely related to the exact sciences. Moreover, beginning in the 10th century, Jewish scholars had been actively involved in translating mathematical and scientific manuscripts, for the most part from Arabic into Hebrew and Latin. Since many ancient Greek scientific texts had been preserved only through Arabic translations, the translations into Latin played an important role in bringing both ancient and Islamic mathematical knowledge to Europe. This culture of translation was particularly lively in places



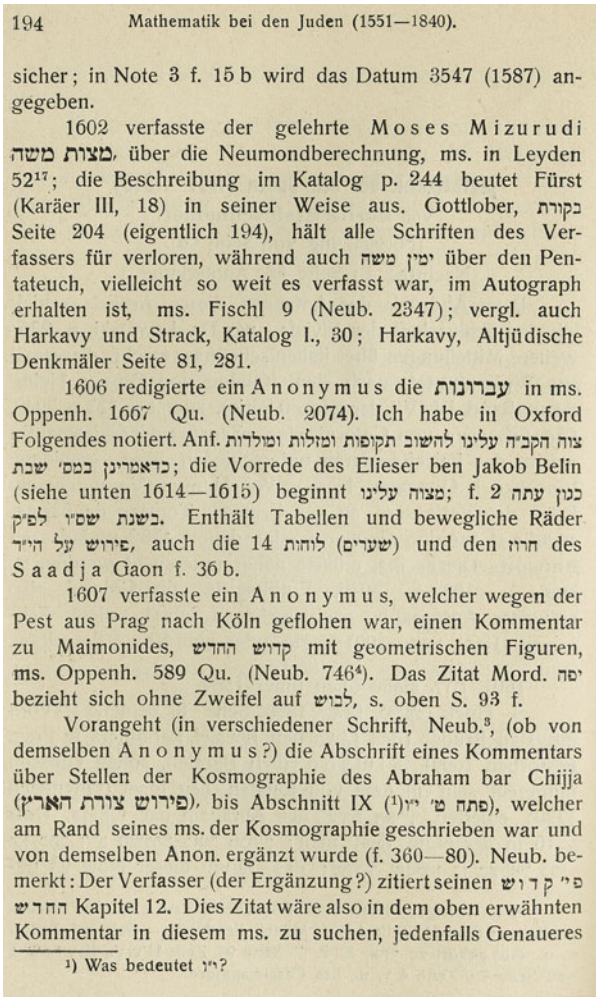
Monatsschrift
für
Geschichte und Wissenschaft
des
Judentums.

Begründet von **Dr. Z. Frankel,**
fortgesetzt von
Professor Dr. H. Graetz und **Dr. P. F. Frankl,**
neue Folge,
im Verein mit Drof. Dr. **David Kaufmann** ins Leben gerufen
und herausgegeben
von **Dr. M. Brann.**

ORGAN
der
Gesellschaft zur Förderung der Wissenschaft des Judentums.

Neunundvierzigster Jahrgang. 49
Neue Folge, dreizehnter Jahrgang. 13

BRESLAU.
KOEBNERSCHE VERLAGSBUCHHANDLUNG.
(Barasch & Riesenfeld.)
1905.



194 Mathematik bei den Juden (1551—1840).

sicher; in Note 3 f. 15 b wird das Datum 3547 (1587) angegeben.

1602 verfasste der gelehrte Moses Mizurudi מצות משה, über die Neumondberechnung, ms. in Leyden 52[17]; die Beschreibung im Katalog p. 244 beutet Fürst (Karäer III, 18) in seiner Weise aus. Gottlober, בקורת Seite 204 (eigentlich 194), hält alle Schriften des Verfassers für verloren, während auch ימין משה über den Pentateuch, vielleicht so weit es verfasst war, im Autograph erhalten ist, ms. Fischl 9 (Neub. 2347); vergl. auch Harkavy und Strack, Katalog I., 30; Harkavy, Altjüdische Denkmäler Seite 81, 281.

1606 redigierte ein Anonymus die עברונות in ms. Oppenh. 1667 Qu. (Neub. 2074). Ich habe in Oxford Folgendes notiert. Anf. ציה הקב"ה עלינו להשוב תקופות ומזלות ומולדות כדאמרינן במס' שבת; die Vorrede des Elieser ben Jakob Belin (siehe unten 1614—1615) beginnt מצוה עלינו; f. 2 כגון עתה בשנת שסיו לפ"ק. Enthält Tabellen und bewegliche Räder סירוש על הי"ד, auch die 14 לוחות (שערים) und den חרוז des Saadja Gaon f. 36 b.

1607 verfasste ein Anonymus, welcher wegen der Pest aus Prag nach Köln geflohen war, einen Kommentar zu Maimonides, קדוש החדש mit geometrischen Figuren, ms. Oppenh. 589 Qu. (Neub. 746[4]). Das Zitat Mord. יסה bezieht sich ohne Zweifel auf לבוש, s. oben S. 93 f.

Vorangeht (in verschiedener Schrift, Neub.[8], (ob von demselben Anonymus?) die Abschrift eines Kommentars über Stellen der Kosmographie des Abraham bar Chijja (פירוש צורת הארץ), bis Abschnitt IX (1) יו (פתח ט'), welcher am Rand seines ms. der Kosmographie geschrieben war und von demselben Anon. ergänzt wurde (f. 360—80). Neub. bemerkt: Der Verfasser (der Ergänzung?) zitiert seinen פ' קדוש החדש Kapitel 12. Dies Zitat wäre also in dem oben erwähnten Kommentar in diesem ms. zu suchen, jedenfalls Genaueres

1) Was bedeutet יו?

Title page and excerpt from one of Steinschneider's texts

where the different traditions interacted, such as the city of Toledo in Spain or the court of Frederick II in Sicily.[5]

Steinschneider emphasized that the 12th century had been "decisive for the general development of European civilization as a result of the translation of Arabic scientific texts that were themselves based on the works of the ancient Greeks. Jews had a share in this activity. Alongside the first translator we also find a Jewish mathematician, Abraham of Barcelona, who for the benefit of his fellow Jews in neighboring areas who knew no Arabic clad Arabic mathematics and astronomy texts in a Hebrew garment which a Christian colleague then replaced by a Latin one. Soon thereafter, the fanaticism of the Almohads drove out a number of Jewish scholars into Christian areas. Thanks to their own texts and to Hebrew translations of Arabic manuscripts, these scholars contributed to the spread of hitherto unknown concepts and findings and of new terms to describe them."[6]

A substantial part of Arabic, Hebrew and Latin mathematical work of this period relates to astronomy. It is hardly surprising that Jews should be particularly interested in astronomy, given that the Jewish calendar necessitates special calculations. Since the Jewish year is based on the motion of the moon, the length of the calendar year varies, with an "intercalary" month added every few years.[7]

1 See (Steinschneider 2001 [1901]: 20, 211). On Moritz Steinschneider, see (Kohut 1896) as well as (Steinschneider 1995) and (Figeac 2007).
2 (Steinschneider 2001 [1901]: 21).
3 Ibid.: 22.
4 On the activities of Jewish scholars, see (Richarz 1974), (Toury 1986), (Dann 1986). On Jewish mathematicians, see (Steinschneider 1893, 1901, 1899 und 1905) as well as (Steinschneider 2001 [1901]).
5 See (Langermann 1999).
6 (Steinschneider 2001 [1901]:82-83).
7 On the Jewish calendar, see (Basnizki 1998). Until his dismissal, Ludwig Basnizki (1885-1957) was a mathematics teacher in Heidelberg. He wrote a book about the Jewish calendar which was still published in 1938 in Nazi Germany. A year later, he managed to flee to Brazil via Switzerland.

Steinschneider described the reasons why Jewish scholars engaged in mathematics as follows: "The real motives are to be found in the texts themselves, and if Jews' special inclination for and skill in mathematics is based on their external history, then it is the very and complete absence of any writings on mechanics that puts us on the right track. People who are excluded from public life, partially from social life (the latter also through certain laws regarding public ceremonies), naturally turn toward more *abstract* objects; Russian Jews today still gladly work on the invention of the calculator and not a few Jews are among the stars in the unprofitable art of chess, hence abstract combinations."[8] As a special motive for mathematical research Steinschneider emphasized the calculation of the Jewish calendar. Special difficulties were associated with the exact determination of Passover (much in the same manner as the Christian calendar required sophisticated calculations for

Jewish Calendar

8 (Steinschneider 2001 [1901]: 22).

Easter). Any interaction between Jews and Christians also required calculations to 'translate' the days, months and years of the Jewish calendar into Julian and, after 1582, Gregorian dates.[9]

General conditions for Jewish mathematicians

How Jews lived in Europe depended strongly on the policies of the Christian majority, even if these were not related directly to Jews. External political circumstances determined Jewish life for centuries, mostly in a negative way with rules intended to distinguish, separate and exclude. Even when they were not facing physical threat in the form of persecution or pogroms, Jews were forbidden to live in many towns and villages, or forced to live in certain quarters, and in many towns their numbers were restricted. They had to pay more taxes than their Christian neighbors. Furthermore, Jews were barred from most professions, could not travel freely and were excluded from political participation. Their political and legal conditions changed over time and varied depending on their countries or areas of residence; in all places Jews – and even those families which for one reason or another were granted residence rights – depended on the religious and political authorities for their protection. Jewish lives were always in danger: at any moment a pogrom could break out, at any moment they could be forced to leave.

Thus for centuries Jewish mathematicians were often only able to work in secrecy and isolation. Constant persecution and discrimination made it impossible for more than a few among them to find recognition. Steinschneider, a scholar who was fluent in at least eight languages (Hebrew, Greek, Arabic, Latin, German, English, French, and Italian), had to repeat again and again that biographical information about a particular author was "very small because Jewish authors led very quiet scholarly lives, if they were not driven away by persecution or hardship."[10] Even during the so-called period of Enlightenment in the 18th century and under princes and kings who considered themselves enlightened, information on the lives of Jewish mathematicians remains very scarce. In this period, the gap between Jewish mathematical scholarship and the rapid general development of mathematical sciences in Europe widened, not least because Jewish scholars were still not free to participate in the academic life of the society in which they lived.

What political and legal conditions were necessary for Jewish mathematicians to come to the attention of their Christian colleagues? When were they finally allowed to enter institutions such as academies and universities? When were they allowed to teach and do research under equal conditions? Indeed, did equal conditions ever really apply?

Persecutions and forced conversion

For centuries Christians attempted to force Jews to abandon their religion and convert.[11] But although conversion often seemed to be a chance to avoid discriminatory practices and solve the problem of isolation and exclusion, it was by no means the key to acceptance into the Christian community. For many Jews, baptism represented a betrayal of the Jewish people, the religion, family and friends. On the other hand, forced conversions had been a familiar component of Jewish history since

9 As an example: the year 5771 comprises the period from September 2010 to September 2011; the following year, 5772, begins on September 29, 2011.

10 (Steinschneider 2001 [1901]: 32).

11 For the 18th century, see the dispute with Johann Caspar Lavater (1741-1801), a Swiss priest who first admired Moses Mendelssohn but who in 1770 publicly called for his conversion, an action that hurt Mendelssohn deeply. On this debate, in which Mendelssohn was supported by Gotthold Ephraim Lessing and Immanuel Kant, among others, see in particular (Altmann 1973); see also (Schulte 2002), (Knobloch 1979).

the beginning of the Diaspora. Steinschneider avoided addressing the problem of conversion in his articles by using the term "oriental authors" instead of "Jewish converts" for Jewish scholars who had converted to Islam. He referred to converted Jews as "Jewish scholars" only if it was known that they had grown up in Jewish families. He was not able to follow this practice consistently. His ideas regarding conversion in the medieval period echoed the attitudes of his own time, while at the same time showing the difficulties of ascertaining the role of Jewish scholarship in the history of the sciences: "In addition to Arab science, Jews also began to be interested in Islam. It is neither easy nor rewarding to seek the motives which underlie religious conversion: love, ambition, self-interest, indifference toward one's own religion and similar issues certainly played a role for most renegades, or proselytes, with the occasional exception of new beliefs gained at a mature age. All we seek here is an answer to the general question: *do Jews who have left the community still belong to Jewish history?* Usually we distance ourselves from Jews by birth, who were led to the new religion by parents or others. On the other hand, it is certainly not an objective historical approach which, in the case of Jewish converts, places responsibility for the negative elements of the personality on their ancestry. In cultural history, therefore, the question is whether or not a specific scholar received his initial education under Jewish influence. This, however, cannot be proven in all cases, at least for Jews who were living among Arabs, about whom we can often get information only from Arabic sources."[12]

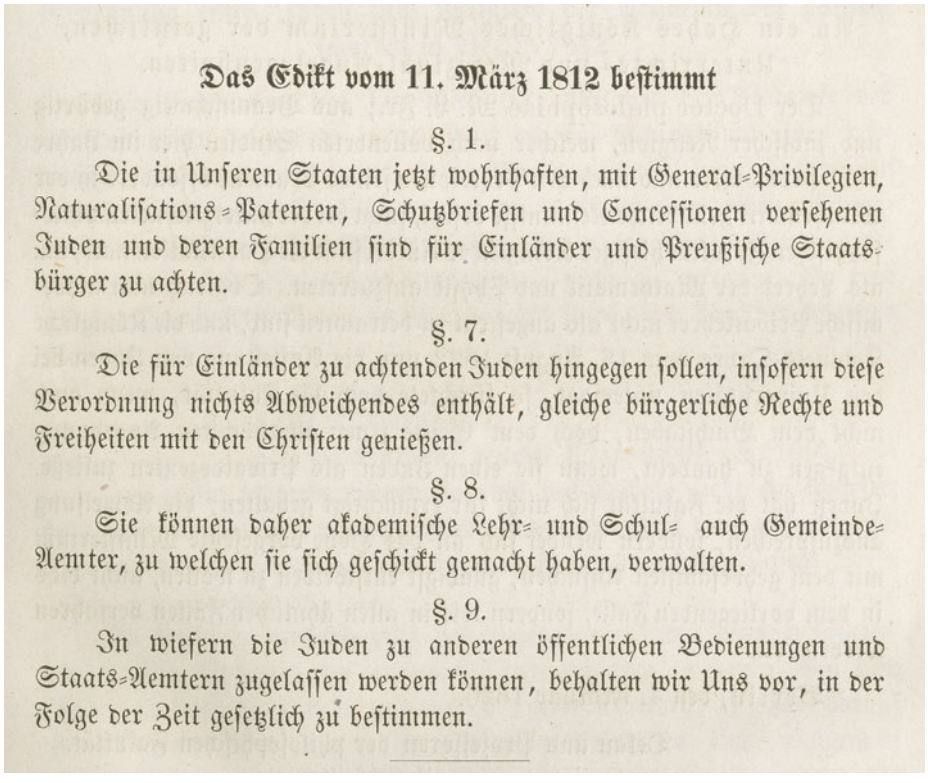
As a result of incessant persecution, Jews were forced to move from one place to another, sometimes escaping with not much more than their lives. In the course of these migrations, two major groups of Jews settled in different countries. Those who were driven out of Spain and Portugal in the 15th century, the Sephardic Jews, resettled mostly in the Netherlands, in the northern German states, in France, Italy and the Ottoman Empire. Jews who were chased out of German-speaking areas in the Middle Ages, as crusaders marched through Europe, escaped to Eastern Europe. The Ashkenazi Jews spoke a dialect of medieval High German that gradually integrated Hebrew and Slavic elements (mostly Polish, Russian and Ukrainian) to create Yiddish. Yiddish became the language most Jews in Central and Eastern Europe read and spoke until the Holocaust. Most of the mathematicians mentioned in this exhibition came from Ashkenazi families.

Equality: de jure, not de facto

The French Revolution of 1789 played an enormous role in Jewish history in Europe. For the first time, Jews in France became citizens with equal rights. Unlike the new nation state in France, the German territories at this time remained divided in various larger and smaller states (until the German unification in 1871). French law was introduced in the areas that were temporarily occupied by Napoleon (particularly along the Rhine), but it was later repelled as these territories fell back to German control. It was to take more than another 50 years – until 1848 – until Jews finally attained legal equality in the German states. But even then this equality was often merely on paper, and actual developments proceeded along quite different lines.[13] The legal equality of Jews, which began in 1812 with the Prussian Emancipation Edict and improved as a result of the Revolution of March 1848, was an equality that can only be described as *de jure*, not *de facto*. In academic life, it did not lead to Jews being appointed professors on an equal basis with Christians. Discrimination

12 (Steinschneider 2001 [1901]: 49).

13 (Richarz 1974), (Schuder 1989), (Toury 1972) and (Kalisch 1860). Among the rich literature on modern Jewish history the work of Simon Dubnow (Dubnov) (1860-1941) should receive particular attention. See (Dubnow 1925), (Elbogen 1930).



Das Edikt vom 11. März 1812 bestimmt

§. 1.

Die in Unseren Staaten jetzt wohnhaften, mit General-Privilegien, Naturalisations-Patenten, Schutzbriefen und Concessionen versehenen Juden und deren Familien sind für Einländer und Preußische Staatsbürger zu achten.

§. 7.

Die für Einländer zu achtenden Juden hingegen sollen, insofern diese Verordnung nichts Abweichendes enthält, gleiche bürgerliche Rechte und Freiheiten mit den Christen genießen.

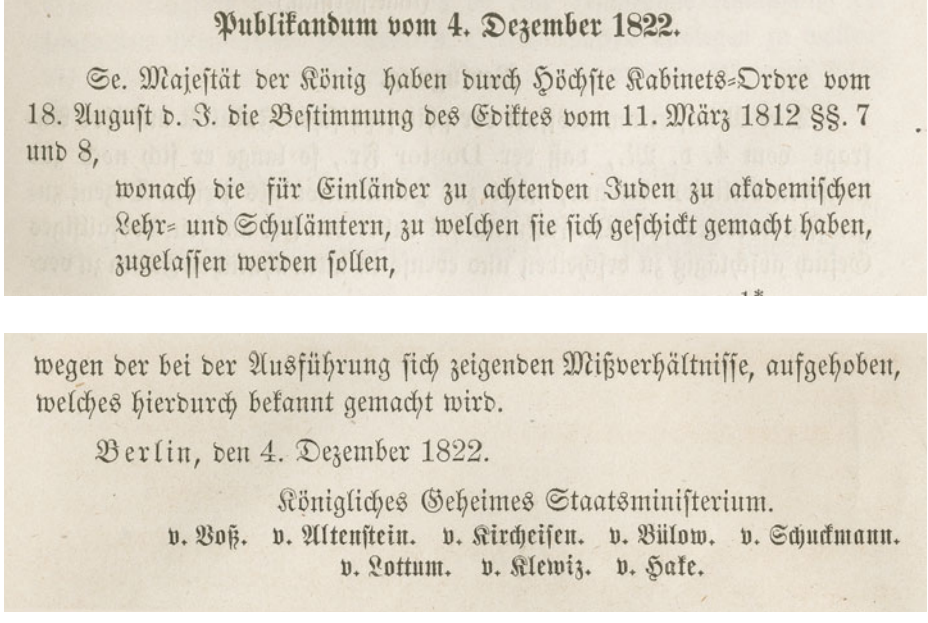
§. 8.

Sie können daher akademische Lehr- und Schul- auch Gemeinde-Aemter, zu welchen sie sich geschickt gemacht haben, verwalten.

§. 9.

In wiefern die Juden zu anderen öffentlichen Bedienungen und Staats-Aemtern zugelassen werden können, behalten wir Uns vor, in der Folge der Zeit gesetzlich zu bestimmen.

The Prussian "Jewish Edict" of 1812



Publikandum vom 4. Dezember 1822.

Se. Majestät der König haben durch Höchste Kabinets-Ordre vom 18. August d. J. die Bestimmung des Ediktes vom 11. März 1812 §§. 7 und 8,

wonach die für Einländer zu achtenden Juden zu akademischen Lehr- und Schulämtern, zu welchen sie sich geschickt gemacht haben, zugelassen werden sollen,

wegen der bei der Ausführung sich zeigenden Mißverhältnisse, aufgehoben, welches hierdurch bekannt gemacht wird.

Berlin, den 4. Dezember 1822.

Königliches Geheimes Staatsministerium.

v. Voß. v. Altenstein. v. Kircheisen. v. Bülow. v. Schuckmann.
v. Lottum. v. Klewiz. v. Hake.

Partial annulment of the "Jewish Edict" in 1822

continued even after the unification of Germany in 1871, in the course of which legal equality for Jews was extended to the new Empire as a whole, and it remained very rare for Jewish academics to be appointed professors.

Conversion sometimes, but not always, presented an option for career advancement. As Heinrich Heine once said, the certificate of baptism was the "entry ticket into European culture".[14] An outright "epidemic of baptisms" took place in Prussia between 1820 and 1830, the result of the discrimination felt by Jews in most professions. Looking back, Jacob Jacobson described the situation in Prussia as follows: "The Emancipation Edict might have provided access to positions at schools

14 "Der Taufzettel ist das Eintrittsbillet zur europäischen Kultur", see (Heine 1976). Heine's own conversion, however, did not help him much; he had hoped for a position in civil service, which he never obtained.

and academic institutions as well as positions in local administration offices, but the decision about whether Jews would also be granted access to other public services and government positions was reserved for later regulations (Sections 8 and 9 of the Edict). This delayed decision had been a concession to those ministers and advisors who had not been able to decide in favor of such a radical change in existing practice. Their opinions now took on increased weight, and the king decided that in a Christian state only those who professed the religion of the state could exert true administrative power. The Cabinet Order of 18 August 1822, therefore, excluded those who remained Jewish from any academic career path, a decision that led to many baptisms."[15]

Jews were given legal equality in Prussia after the March Revolution of 1848. The new constitution of 1850 granted civil rights to all citizens independently of their religion. Nevertheless, discrimination of German Jews continued, and restrictions and limitations remained in place. Their equality was only *de jure*, not *de facto*. This remained true even after the introduction of the federal constitution of July 1869, which lifted previous "restrictions of the rights of citizens and residents based on the various religious denominations".[16] After the unification of Germany in 1871, the new constitution of the Wilhelmine Empire adopted elements of the 1850 Prussian constitution and of the federal constitution of 1869 on the rights of citizens independently of their religion. The constitution of the Weimar Republic, proclaimed in 1919, was based on the constitutions of 1850 and 1871. The main changes from earlier constitutions concerned the type of government, which was now a parliamentary democracy and a republic rather than a constitutional monarchy. Many other details, including the regulations for Jews, remained unchanged.[17]

The situation of Jewish scholars changed only little in the years between 1848 and 1933, despite the regulations in the various German constitutions. During the Weimar Republic, there were isolated improvements, for example at universities, where religion no longer had to be mentioned in the curriculum vitae that had to be published in dissertations.[18] Although religion officially no longer played a role, from 1930 onwards it once again became difficult for Jews even to find jobs.[19] The situation of Jewish mathematicians remained problematic throughout the Weimar Republic. There were important intellectual successes and hopes in academic life, but on the other hand Jews still had to cope with fears and threats, desecration of cemeteries and physical attacks. Because the federal principle continued to apply to schools and higher academic institutions during the Weimar Republic, the status of Jewish mathematicians differed in the various German states. To a certain extent and in some locations and cities there was a remarkable flourishing of German-Jewish cultural and intellectual life. At the same time anti-Semitic hostility increased and universities ignored Jewish mathematicians when full professorships were offered.

15 (Jacobson 1962: 16). Dr. Jacob Jacobson (1888-1968) was head of the Archives of German Jews (*Gesamtarchiv der deutschen Juden*). As a historian he was intimately involved in the collection and evaluation of historical sources on German Jews. His publications after 1945 became possible only because his wife and son had taken his papers with them to Great Britain when they went into exile. He survived the Theresienstadt concentration camp. In 1945 he was able to join his family to London, where he then worked at the Leo Baeck Institute.

16 (Jacobson 1962: 45).

17 Section 3 of the second main part of the Weimar constitution dealt with "religion and religious organizations" as described in articles 135 to 141. Article 141 of the Weimar constitution became an element of the constitution (Grundgesetz) of the Federal Republic of Germany.

18 This was based on the Weimar constitution, article 136 (3), according to which no one was required to make their religious convictions public, except for statistical surveys.

19 See the anonymous essay "Probleme der Berufswahl" [problems in choosing a profession] in (*Jüdisches Adressbuch* 1931: 42-43).

Advancement through education

Education is one of the most important traditions in Jewish life. Jewish boys began to read and write Hebrew as early as three, and because of this tradition most were literate in at least Hebrew and Yiddish. At the same time, they often learned the language of the region and of the country in which they lived; thus German became one of the languages many Jews learned in several areas of Middle and Eastern Europe that belonged to the Kingdom of Prussia or the Habsburg monarchy.

Jews were not allowed to study at universities in German-speaking areas until 1678, and even then their access to higher education was patchy at best: university access depended on the policies of each German state and on how their authorities related to "their" Jews .[20] For historic reasons, Prussia played a relatively positive role in this context, and therefore many of the examples featured in the exhibition are related to Prussia.

The opening of the universities

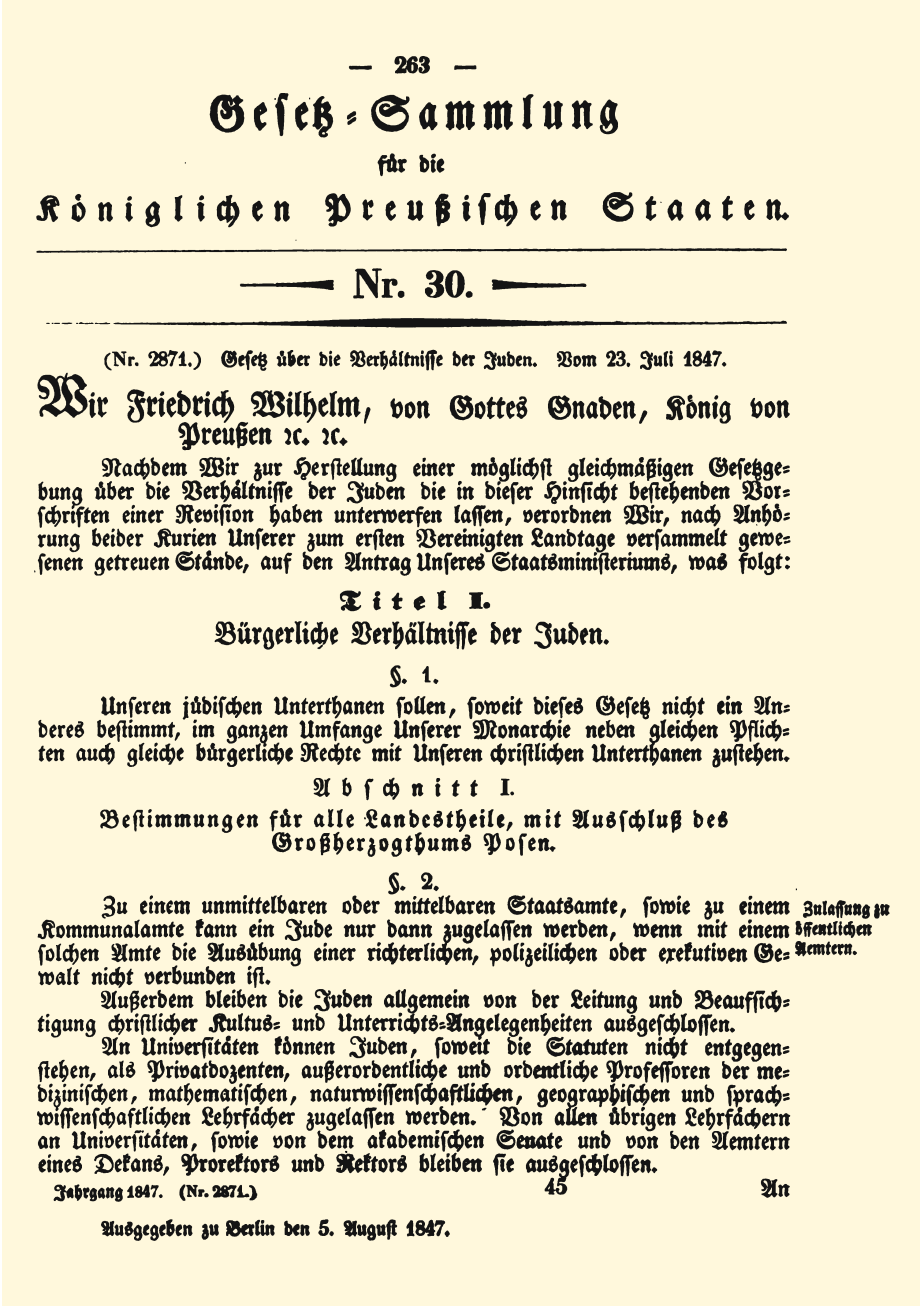
The opening of universities to Jews was not an acknowledgment of equality for all citizens regardless of religion, but rather the result of efforts by authorities to exert influence in Jewish communities. Thus, the authorities required physicians and rabbis who were employed by Jewish communities to hold doctoral degrees, and consequently Jews who wanted to become rabbis or doctors had to attend university, so that in many universities the faculties of philosophy and medicine were the first to admit Jewish students. The universities, however, were prepared to enroll Jewish students only under protest. At many universities, for example at Königsberg, tuition for Jewish students was twice what non-Jewish students had to pay.

Monika Richarz investigated in great detail the exact dates when Jews were allowed to study medicine, philosophy and other disciplines in the German states, when they were allowed to receive doctoral degrees and write their habilitation, and when they were appointed full professors. There were significant differences between the different German states and their universities concerning which disciplines were accessible to Jewish students. The first Jew who received a doctoral degree in medicine was a student at the University of Frankfurt an der Oder in 1721. The first doctoral degree in law awarded to a Jewish student was in 1799 from the University of Göttingen. The first doctoral degree granted by a philosophical faculty, which at the time included mathematics and science, was finally awarded nearly one hundred years after the first degree in medicine, in 1817. At the University of Halle, for example, at least 28 Jewish students received doctoral degrees between 1817 and 1848, eighteen of which were candidates who wrote on oriental or biblical topics and only two of which were in mathematics.[21]

The process of opening universities to Jewish students was far from being a story of straightforward successes. On the contrary: it was often characterized by setbacks and interrupted by anti-Semitic campaigns and pogroms. In early August 1819, for example, students at the University of Würzburg carried out pogrom-like attacks on Jewish residents and students; similar pogroms soon broke out in Heidelberg, Karlsruhe and other cities as well. Jews were hunted down with the notorious "Hep

20 On this development, see (Richarz 1974).
21 See (Richarz 1974).

The Law of 1847



— 263 —

Geſetz-Sammlung

für die

Königlichen Preußiſchen Staaten.

Nr. 30.

(Nr. 2871.) Geſetz über die Verhältniſſe der Juden. Vom 23. Juli 1847.

Wir Friedrich Wilhelm, von Gottes Gnaden, König von Preußen ꝛc. ꝛc.

Nachdem Wir zur Herſtellung einer möglichſt gleichmäßigen Geſetzgebung über die Verhältniſſe der Juden die in dieſer Hinſicht beſtehenden Vorſchriften einer Reviſion haben unterwerfen laſſen, verordnen Wir, nach Anhörung beider Kurien Unſerer zum erſten Vereinigten Landtage verſammelt geweſenen getreuen Stände, auf den Antrag Unſeres Staatsminiſteriums, was folgt:

Titel II.

Bürgerliche Verhältniſſe der Juden.

§. 1.

Unſeren jüdiſchen Unterthanen ſollen, ſoweit dieſes Geſetz nicht ein Anderes beſtimmt, im ganzen Umfange Unſerer Monarchie neben gleichen Pflichten auch gleiche bürgerliche Rechte mit Unſeren chriſtlichen Unterthanen zuſtehen.

Abſchnitt I.

Beſtimmungen für alle Landestheile, mit Ausſchluß des Großherzogthums Poſen.

§. 2.

Zulaſſung zu öffentlichen Aemtern.

Zu einem unmittelbaren oder mittelbaren Staatsamte, ſowie zu einem Kommunalamte kann ein Jude nur dann zugelaſſen werden, wenn mit einem ſolchen Amte die Ausübung einer richterlichen, polizeilichen oder exekutiven Gewalt nicht verbunden iſt.

Außerdem bleiben die Juden allgemein von der Leitung und Beaufſichtigung chriſtlicher Kultus- und Unterrichts-Angelegenheiten ausgeſchloſſen.

An Univerſitäten können Juden, ſoweit die Statuten nicht entgegenſtehen, als Privatdozenten, außerordentliche und ordentliche Profeſſoren der mediziniſchen, mathematiſchen, naturwiſſenſchaftlichen, geographiſchen und ſprachwiſſenſchaftlichen Lehrfächer zugelaſſen werden. Von allen übrigen Lehrfächern an Univerſitäten, ſowie von dem akademiſchen Senate und von den Aemtern eines Dekans, Prorektors und Rektors bleiben ſie ausgeſchloſſen.

Jahrgang 1847. (Nr. 2871.) 45 An

Ausgegeben zu Berlin den 5. Auguſt 1847.

Hep" calls.[22] When public authorities in one place annulled a prohibition or removed a hurdle, sooner or later a new prohibition was ratified or a new hurdle established. For example, although the Prussian Edict of 1812 granted Jews civil rights, these rights were gradually withdrawn a few years later. From 1822 onwards, habilitation (a postdoctoral qualification for scientific research, usually coupled with the *venia legendi*, i.e. the right to teach at a university), was once again possible only for baptized Jews. This new order was called "Lex Gans" after the student Eduard Gans (1798-1839), who was forbidden to habilitate at Berlin University without converting. When he applied for a position as full professor in 1822, the order allowing Jewish scholars into such positions in exceptional cases was once again repelled. In 1825, Gans converted to Protestantism and in 1826 he was appointed Extraordinarius of law at Berlin University. He finally became full professor in 1828.

22 On the attacks on Jewish students in university cities in August 1819, see (Richarz 1974: 111-112, 119-120).

In Prussia, the "Law on the Status of Jews" passed on 23 July 1847 included a paragraph prohibiting Jews from holding government and municipal positions, especially judicial positions. They were permitted to teach at universities in certain disciplines – medicine, mathematics, sciences, geography and philology – while continuing to be excluded from such positions as deans of faculties and presidents of universities. They were also not allowed to become teachers at public schools.[23]

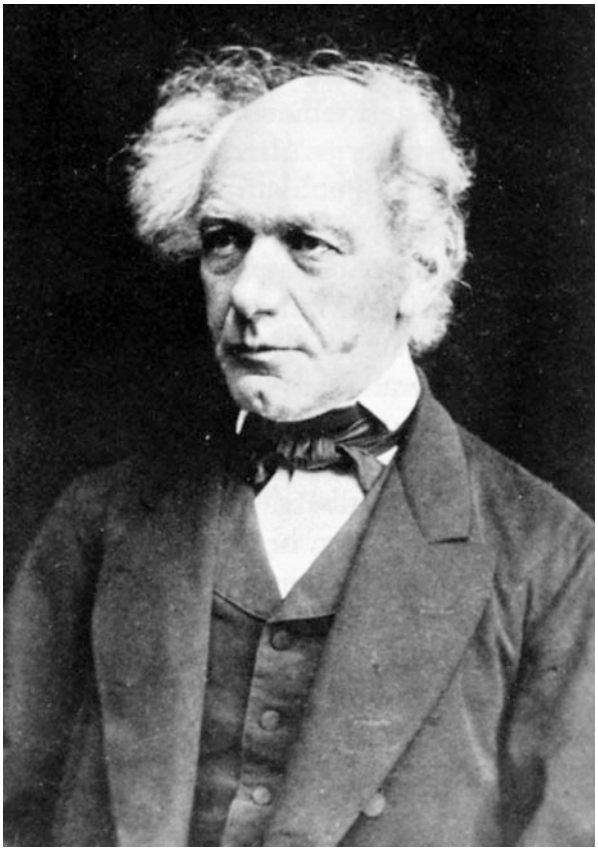
Moritz Kalisch convincingly showed that occasionally the negative attitude that prevailed in faculties and universities was even more rigid than that of the Ministry of Culture. The vote of Prussian universities in 1847 on the question of whether they should allow Jews to hold professorships in medicine, mathematics and sciences was remarkable.[24] At that time, Jews had already been studying at Prussian universities for more than 50 years, and for at least 25 years a few scholars – who had converted – had been teaching at some universities. However, a front of "educated citizens" and privy councilors stood against the "outsiders", as Jewish scholars were still viewed. The universities accepted the edict of 1847 very much against their will. As a result it is hardly surprising that only in few exceptional cases were Jewish scholars given appointments as full professors, among them some mathematicians. At Friedrich Wilhelms University in Berlin, the first unconverted Jew, Levin Goldschmidt (1829-1897), was appointed full professor in 1875 – as professor of commercial law in the Law Faculty.[25]

Jacob Jacobson described the legal barriers as follows: "When the law was introduced in 1847, Jews had been waiting for it for decades, hoping that it would standardize their legal status in the different regions of Prussia [...]. Thirty-five years after the Hardenberg Edict (of 1812), it did not represent much progress in terms of the civil rights of German Jews. But then on 6 April 1848, two weeks after the outbreak of the March Revolution, an order was announced which granted civil rights independently of any religion. And the Prussian constitution introduced on 31 January 1850 declared that the exercise of civil rights should be independent from the practice of any religion."[26] But Jacobson cautiously added that "what had been achieved in theory was what the best and most dedicated Jews in Prussia had fought for so long. However, practice lagged a long way behind theory."[27] The reality was: equal rights *de jure*, but not *de facto*.

Between 1810, when the first habilitation without conversion became possible, and 1848, only eighteen Jewish scholars became Privatdozenten (i.e. members of faculty who have passed the habilitation and are allowed to teach). Seven of these later became professors, including four who underwent baptism in order to get the professorship. Moritz Abraham Stern (1807-1894) was the only mathematician among these eighteen scholars.[28] Stern studied at Göttingen, received his doctoral degree there and successfully completed his habilitation in 1829. In 1848 he became an

23 See (Kalisch 1860: 83), also (Jacobson 1962: 28-29).
24 See (Kalisch 1860: 81-232), "Vota der preussischen Universitäten über die Zulassung jüdischer Lehrer nach dem Gesetz vom 23. Juli 1847" [Vote of the Prussian universities on the admission of Jewish teachers according to the law of 23 July 1847].
25 See (Lenz 1918).
26 (Jacobson 1962: 29). Until 1847, various laws which included sections on the exclusion of Jews had been in force in different regions of Prussia, and therefore Jacobson emphasized success with regard to the standardization of regulations. This law was enacted in spite of the fact that most universities were against the participation of Jewish scientists as equals. On the vote, see (Kalisch 1860: 81-232).
27 (Jacobson 1962: 29).
28 See the tables in (Richarz 1974: 208).

Moritz Abraham Stern



Extraordinarius (a paid or unpaid associate professor). When he got a full professorship at Göttingen University in 1859, he was the first – non-baptized – German Jew allowed to serve as a full professor at a German university.[29]

In 1906, Alfred Stern wrote about his father: "My father, however, had decided to try his luck as an academic teacher at Georgia Augusta (the university in Göttingen). The path was thorny, he knew that. Until then there had been no Jewish full professor in Germany. When his friend, the Frankfurt lawyer Goldschmidt, learned of his intention, he said, 'You must be mad.' But [my father] felt the courage and power to attempt the unprecedented."[30]

29 See Alfred Stern (1906), in: (Richarz 1976: 404-416). Moritz Stern's son, the historian Alfred Stern (1846-1936), wrote a biography of his father in 1906; the family history was published privately in Zurich. (Schmitz 2006) published a new monograph on Moritz Stern.

30 (Stern 1976 [1906]: 406).

Robert Remak Sr.

The grandfather of the Berlin mathematician Robert Remak, the physician Robert Remak Sr. (1815-1865), was also among the eighteen Jews who became Privatdozent. In 1847 he was the first Jew allowed to submit a habilitation thesis at the Medicine Faculty of Berlin University.[31] His habilitation became possible only after a direct appeal to the Prussian king, which he submitted on 24 February 1847. It was his second such petition. Once again, he requested to be allowed to teach at Berlin University as Privatdozent, independently of his Jewish religion. In his second petition, Remak wrote self-confidently and explained openly – against the advice of his friend Alexander von Humboldt (1769-1859) – that for him, as a matter of principle, conversion was not an option for avoiding ongoing discrimination.[32] Thanks to the support of von Humboldt, who had close relations to the royal family, the unexpected happened: in 1847, King Friedrich Wilhelm IV issued an order that Robert Remak – as the first Jew in the Medicine Faculty – be allowed to submit a habilitation thesis and become Privatdozent. It was a sensation, and every Berlin newspaper reported on it.[33] In 1847 Remak married Feodore Meyer (1828-1863), the daughter of a Berlin banker, with whom he had two sons. The attempt to elect him into the Royal Prussian Academy of Science in 1853 failed.[34]

Ernst Remak (1849-1911), one of the sons of Robert Remak Sr., also became a physician and, in 1902, unpaid Extraordinarius at Berlin University – 25 long years after his habilitation! In 1910 he was honored by the German Kaiser with the title "Medizinalrat" (privy medical councilor). His son Robert Remak Jr. (1888-1942) 1942), a mathematician, became Privatdozent at Berlin University and later perished at the hands of the Nazis.[35] The Remak family exemplifies the fate of German Jews: from exclusion to advancement and acceptance, but then again to dismissal, persecution and genocide, all in less than one hundred years, from 1847 until 1942.

31 Nathan Jacob Friedlaender (1778-1830) had been the first Jewish Privatdozent at the Medical Faculty of Berlin University in 1810, when the university was opened, but he had no habilitation. See (Lenz 1910) on Friedlaender and Remak; see also (Jacobson 1962: 44, 81).

32 See (Kalisch 1860: 21-23), as well as (Kisch 1954: 270-271), in an English translation.

33 See (Schmiedebach 2003: 410-411).

34 It was Alexander von Humboldt again who tried to convince the members of the Berlin Academy of Science to elect Robert Remak. But Remak did not receive the required majority of votes. The archives do not reveal who did not vote for Remak or why. See Archive Berlin-Brandenburgische Akademie der Wissenschaften: Personalia OM, 1853-1861, II-III, 24, Bl. 38 and 48 as well as II-Vc, 114, Bl. 85.

35 On Robert Remak sen. see (Kisch 1954) and (Schmiedebach 1995); on the Remak family and Robert Remak jun. see (Vogt 1998).

Haskalah and mathematics

In the 18th century, before it became a center for mathematics, Berlin had become the cradle of Haskalah, or Jewish Enlightenment. Haskalah is inextricably linked with the name of Moses Mendelssohn (1729-1786), an independent scholar who studied and investigated problems of philosophy, history and mathematics.[36] His publications influenced the development of philosophy and research on Judaism. His friendship with the German author Gotthold Ephraim Lessing and the mutual respect that existed between Moses Mendelssohn and Immanuel Kant have become famous. Although Mendelssohn was widely recognized as a scholar and had been proposed for membership of the Prussian Academy of Sciences, the Prussian King Frederick II denied him this honor. Mendelssohn's only privilege was that he and his family were allowed to live in Berlin, where right of residency for Jews was still not self-evident at the time.[37]

As a result of Haskalah, Berlin also became a center for "Wissenschaft des Judentums", the scientific research of Jewish history and culture. In 1870 the Hochschule für die Wissenschaft des Judentums was established in Berlin, where it gradually became an important institution. Its predecessor had been the Veitel Heine Ephraimische Lehranstalt, which had opened in 1783, shortly before the death of Moses Mendelssohn. The Lehranstalt had been founded thanks to the support of Nathan Veitel Heine Ephraim (1703-1775), leader of the Berlin Jewish community and jeweler and mint master to the Prussian King. The philosopher Leopold Zunz (1794-1886), the famous scholar Abraham Geiger (1810-1874) and the scholar and bibliographer Moritz Steinschneider, among many others, taught and carried out research at this educational institution.

Moritz Steinschneider lived in Berlin from 1845 onwards. In spite of his scholarly qualities, he could not obtain any academic position and had to work as a private tutor. It was not until the 1860s that he began working for the Berlin Jewish Community. From 1869 until 1890 he was the director of the Girls' School of the Jewish Community. Like many Jews at the time he did not receive full citizenship and could stay in Berlin only with the support of the community.[38] Steinschneider studied the history of Jewish scholars and scientists from 1840 until his death in 1907. Partly as a private scholar, partly supported by grants from libraries, he investigated old manuscripts dating from the 12th to the 19th century. Between 1893 and 1905 he published several articles describing the work Jewish mathematicians had done from ancient times until 1787. Moreover, he became a famous bibliographer of Jewish literature, producing several catalogues of old manuscripts kept in different libraries, such as the Bodleian Library at Oxford, the libraries in Hamburg and Munich, and the Imperial Prussian State Library in Berlin. His work earned him great recognition and respect among scholars in Berlin and beyond. The only official recognition of his scholarship, however, was an assistant position offered to him by the Berlin state library in 1869.[39] The family of Moritz Steinschneider had a fate similar to that of the Remak family. Steinschneider's son Max became a lawyer and was later honored with the title Justizrat. The grandsons of Moritz Steinschneider were forced to leave Germany and emigrated in 1933. One of them, the lawyer Adolf Moritz Steinschneider (born in 1894), was killed by the SS in France in 1944.[40]

36 On the history of the Haskalah, see (Schulte 2002) and (Feiner 2007).

37 The best biography of Moses Mendelssohn is still (Altmann 1973). See also (Knobloch 1979). For Mendelssohn's research on mathematics, see (Lausch 1990, 1998) in German, in English see (Lausch 2002). An anniversary edition of the *Collected Works* of Mendelssohn which had begun in 1929 to commemorate his 200th birthday ended abruptly after the Nazi rise to power. It was continued in 1978 under the editorship of Alexander Altmann and is now, in 2011, nearly complete (33 volumes).

38 See (Jacobson 1962), (Steinschneider 1995) and (Figeac 2007).

39 See (Kohut 1896).

40 See Marie Louise Steinschneider (his daughter), in (Steinschneider 1995); the German Exile Archive has preserved the papers of Adolf Moritz Steinschneider.

Mendelssohn's family

Whereas Moses Mendelssohn had had to earn a living for his family by working as a bookkeeper in a silk factory and could only do scholarly research on the side, his youngest son Nathan Mendelssohn (1782-1852) became a scientist and engineer.[41] In his Berlin workshop at Behrenstrasse 60, he produced astronomical, geodetic and physics instruments, among others for the scientist and explorer Alexander von Humboldt (1769-1859). Humboldt placed an advertisement in the 1806 edition of the journal *Gilberts Annalen der Physik* to promote Nathan Mendelssohn's instruments.[42] Like all but two of Moses Mendelssohn's six children, he chose to be baptized in the hope of escaping ongoing discrimination and hostility. His older brother, Abraham Mendelssohn Bartholdy (1776-1835), became a banker and is remembered today primarily for his children: Fanny (1805-1847) and Felix (1809-1847) became famous composers, while Rebecca (1811-1858) has been known mainly as the wife of the mathematician Johann Peter Gustav Lejeune Dirichlet (1805-1859). The Mendelssohn-Bartholdy family apparently preserved Jewish traditions. The mother, Lea Salomon (1777-1842) remained skeptical about baptism and in a letter complained: "How I wish we could do without this hypocrisy; but the desire for a higher sphere of action than that of a merchant, or a thousand tender ties in which young people become entangled by intercourse with members of other religions, leaves no other way open."[43]

One of Abraham Mendelssohn's letters to his daughter, Fanny, reveals what he thought about religion and Judaism and how he wanted to have his children – not only Fanny – raised. He wrote to Fanny in April 1819 that she should thank and honor the creator – "the maker of us all" – with her conduct, and then continued: "There are in all religions only one God, one virtue, one truth, one happiness. You will find all this if you follow the voice of your heart; live so that it be ever in harmony with the voice of your reason."[44] And in the so-called "Confirmation letter", which he wrote to Fanny from Paris in 1820, he asks: "Does God exist? What is God? [...] All this I do not know, and therefore I have never taught you anything about it. [...] The outward form of religion your teacher has given you is historical, and changeable like all human ordinances. Some thousand years ago the Jewish form was the reigning one, then the heathen form, and now it is the Christian. We, your mother and I, were born and brought up by our parents as Jews, and without being obliged to change the form of our religion have been able to follow the divine in us and in conscience educated you and your brothers and sisters in the Christian faith, because it is the creed of most civilized people, and contains nothing that can lead you away from what is good, and that guides you to love, obedience, tolerance, and resignation, even if it offered nothing but the example of its founder, understood by so few, and followed by still fewer."[45] Moses Mendelssohn's children and grandchildren were thus taught to uphold and preserve the traditions of learning and virtue, of Enlightenment, tolerance and charity.

41 Nathan Mendelssohn was also included in the first volume of Poggendorff. See also (Löwenberg 1883).

42 See (Lausch 1990: 89, n.80).

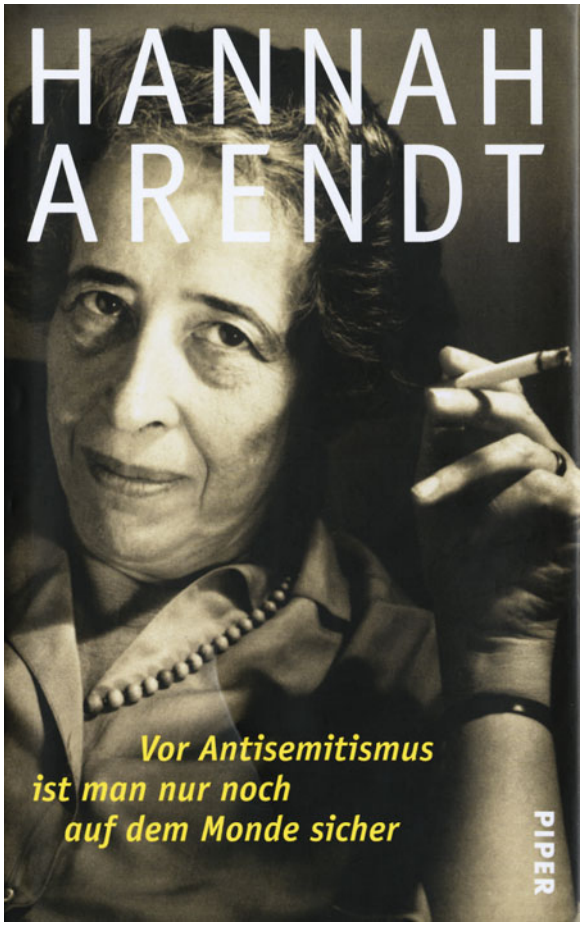
43 Lea Salomon to G. Merkel, Berlin, 2 July 1799, quoted in: (Hensel 1982: 68).

44 Abraham Mendelssohn to Fanny Mendelson, Amsterdam, 5 April 1819, quoted in: Ibid.: 77.

45 Abraham Mendelssohn to his daughter Fanny Mendelson, Paris, 1820, quoted in: Ibid.: 79-80.

The poison of anti-Semitism

"... the moon is the only place where we can still be safe from anti-Semitism", wrote Hannah Arendt (1906-1975) in an article published in December 1941 in the New York German-Jewish newspaper *Aufbau*.[46] Discrimination against Jews and persecution fueled by anti-Semitic sentiment had been a component of Jewish life in Europe for centuries.[47] In 1894 the Austrian writer Hermann Bahr (1863-1934) published interviews with German, British and French intellectuals. He asked them about the sources and reasons of anti-Semitism and how it might be stopped. He tried to understand the awful history and the shame for all intellectuals by comparing it to a "terminal illness".[48]



Hannah Arendt, ed. by M. L. Knott, Munich 2000

The American historian Fritz Stern, who was born in Breslau (now Wrocław) in 1926 and emigrated to the USA with his parents in 1938, also used the metaphor of a dangerous illness which can break out any moment when he chose the following quotation as the motto for his memoirs:

"Dr. Rieux resolved to compile this chronicle, so that he should not be one of those who hold their peace but should bear witness in favour of those plague-stricken people, so that some memorial of the injustice and outrage done them might endure; and to state quite simply what we learn in time of pestilence: that there are more things to admire in men than to despise...
He knew what those jubilant crowds did not know but could have learned from books: that the plague bacillus never dies or disappears for good; that it can lie in dormant for years and years in furniture and linen-chests; that it bides its time in bedrooms, cellars, trunks, and bookshelves; and that perhaps the day would come when, for the bane and the enlightening of men, it would rouse up its rats again and send them forth to die in a happy city."[49]

In the years of the Wilhelmine Empire and in the Weimar Republic, German Jews were confronted with anti-Semitic propaganda and actions in most aspects of their everyday life. They encountered anti-Semitism in schools, streets and shops, in public transport systems and at work. Most Jews first experienced anti-Semitic attacks in their school days. The children of mathematician Otto Toeplitz (1881-1940), Eva and Erich, remembered the rules of "good behavior" their parents taught them: do not stand out, gain acceptance through high achievements. Hannah Arendt was encouraged by her mother to defend herself against any anti-Semitic remarks. Jewish children learned from an early age that they should not become too visible, and that they had to work harder than their Christian classmates. For some this created a strong motivation to study and excel, which in turn benefited those who became scientists.

46 See (Arendt 2007: 143).
47 There is rich literature on the history of anti-Semitism; we mention here only the first chapter of (Arendt 1995 [1955]), (Poliakov 1977-1988), (Benz 2004), (Bergmann 2006) and (Volkov 2000).
48 See (Bahr 1894).
49 Albert Camus. *The Plague* (*La Peste*, 1947). Quoted in: (Stern 2006).

The Berlin anti-Semitism debate

Both Jewish and non-Jewish citizens tried to fight anti-Semitism. This became particularly pressing after the so-called "Berlin anti-Semitism Debate" had made anti-Semitism acceptable for many well-educated Germans. In 1879, the historian Heinrich von Treitschke (1834-1896), professor at Berlin University and a member of the German Parliament from 1871 to 1884, set off this debate with an essay "Unsere Aussichten" [Our views]. This essay contained the phrase "Die Juden sind unser Unglück" [The Jews are our misfortune], which was repeated again and again, especially during the Nazi time. Treitschke's fellow faculty member Theodor Mommsen (1817-1903) resolutely argued against Treitschke's views and encouraged others to join the fray. But Mommsen's fears that anti-Semitism would become socially acceptable became bitter reality. At the end of the 19th century, student fraternities excluded their fellow Jewish students by introducing an "Aryan paragraph" into their statutes, long before this became standard legislation in the Nazi period.

Preis der Nummer 30 Pf.

I. Jahrg. Berlin, Juli 1895. Nr. 1.

Im deutschen Reich.

Zeitschrift,

herausgegeben von dem

Centralverein

deutscher Staatsbürger jüdischen Glaubens.

Inhalt:

Ein Wort zur Einführung.
Ludwig Victor: Unsre Stellung.
Karl Emil Franzos: Familien-Geschichten.
Walter Pohlmann: Judenhaß und Umsturz.
Ali Schanz: Es werde Licht.
Ludwig Geiger: Veit und die Berliner Musenalmanache.
Umschau.
Korrespondenzen.
Vereinsnachrichten.
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The first newspaper of the Centralverein

The *Centralverein deutscher Staatsbürger jüdischen Glaubens* (Central union of German citizens of Jewish faith) was founded in 1893. The very name of this association shows that German Jews defined themselves first and foremost as German citizens.[50] However, it was because of the growing anti-Semitism in Germany that the Union was established. It published books, brochures and pamphlets to disseminate the message "Defend yourself!" ("Wehr Dich!").

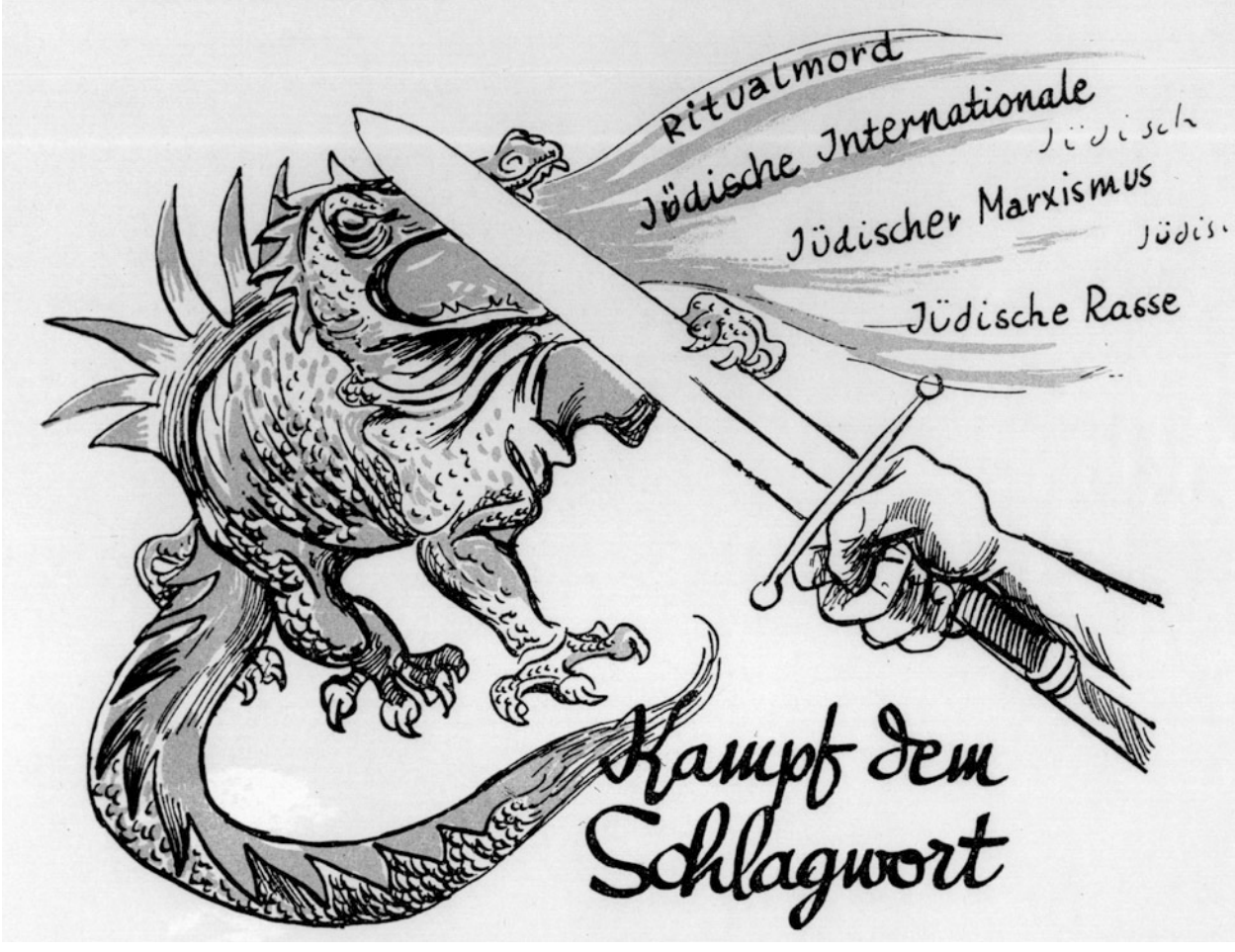
When, in 1896, the association of German students' fraternities (Deutscher Burschentag) decided to exclude Jewish students from becoming members of students' fraternities, the existing fraternities of Jewish students founded their own association, the *Kartell-Convent der Verbindungen Deutscher Studenten juedischen Glaubens*, in order to fight against anti-Semitism at universities.[51]

From anti-Semitic stereotypes to racist anti-Semitism

There is a wealth of literary and historical texts, including autobiographical material, discussing perceptions of anti-Semitism. In 1921, the famous author Jakob Wassermann (1873-1934) wrote *My Life as German and Jew*, where he described his experiences with the everyday anti-Semitism in his life, beginning in his childhood. He illustrated how often racism and stereotypes about Jews were articulated, in what contexts and by whom. What Wassermann described can also be found in letters and autobiographical sketches. The deep roots of anti-Semitism in German society and how the Nazis exploited this broad and diffuse anti-Semitic climate have been well studied. A common experience of many Jewish intellectuals was the need

50 See (Barkai 2002).

51 On the history of Jewish student associations in general and this one in particular, see (Asch 1964) and (Rürup 2008). Adolph Asch (1881-1972) studied law and was a member of this association. He was able to emigrate to Great Britain in 1939, where he wrote this memoir.



Drawing from a brochure published by the Centralverein in 1932. It calls to fight anti-Semitic slogans such as "ritual murder", "Jewish internationalism", "Jewish Marxism", and "Jewish race"

to prove that they were "as good as" their non-Jewish colleagues. Wassermann emphasized: "With every achievement I had to convince it afresh of my own worth and the worth of my cause; I had to employ the most fiery persuasion, the extremest effort, where others needed only to beckon. [...] I, however, had to present my credentials every time [...]".[52] Jewish intellectuals therefore had to work hard, again and again, to be accepted and acknowledged.

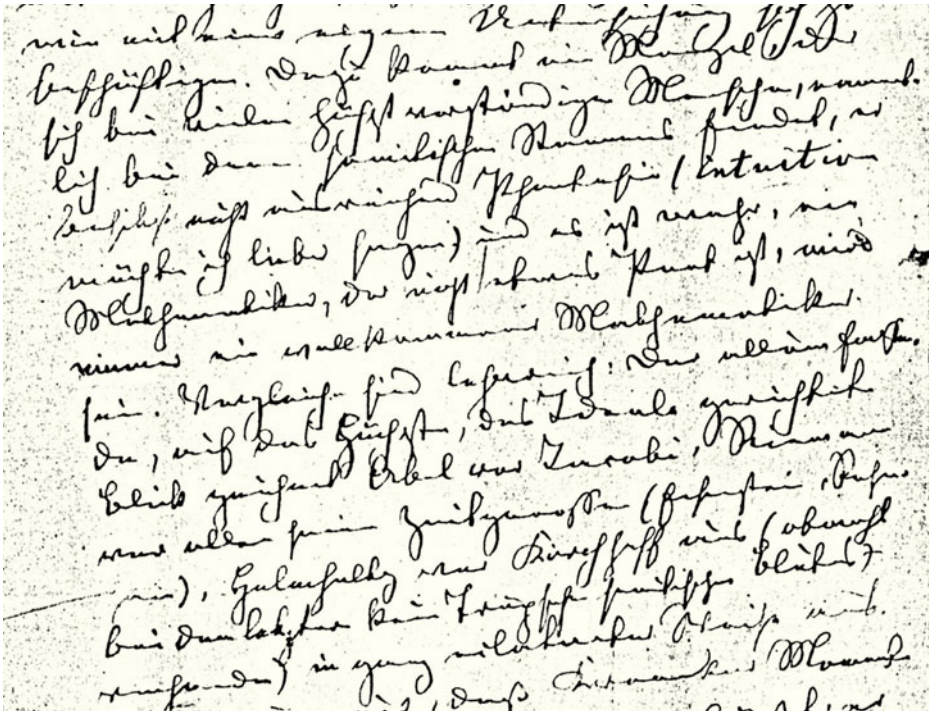
The anti-Semitism of the Wilhelmine Empire was a compound of anti-Semitic stereotypes, prejudices and long traditions of Christian anti-Judaism. Jews and non-Jews alike made statements about particular talents attributed to "the Jews". This mixture of stereotypes, prejudices and religious beliefs often led to insults that Christian interlocutors may not even always have been fully aware of. Both Jews and non-Jews expressed opinions on supposedly unique Jewish talents, whether it was for mathematics or science in general, for abstract thinking or chess, for playing the violin or bargaining. Such stereotypes were often connected with special qualities which Jews supposedly possessed. However, even in cases when stereotypes had a positive connotation (the "typical" talent of Jews for mathematics, chess or the violin), they could still be injurious.

When in 1883 in a letter to Sofia Kovalevskaya the mathematician Karl Weierstrass wrote about a typical "lack of intuition" in otherwise "educated people [...] in the Semitic race," he was referring to a similar widespread stereotype. The same holds true for Felix Klein, who sometimes also adopted the prejudices of his time and

52 (Wassermann 1934: 104).

contemporaries, albeit with mostly positive stereotypes. He suggested that Jews had particular talents in mathematics, while other talents were only to be found in other groups, and that the discipline itself needed all the different talents.

Even Jews themselves were apt to unwittingly fall into the same trap. In 1910, the philosopher Theodor Lessing, who was Jewish, claimed that "it is thus clear that the unique Jewish predisposition must correspond with the necessities of modern mathematics."[53] The borderline between use of stereotypes, anti-Jewish sentiment and openly declared anti-Semitism remained fluid.



A remark from Karl Weierstrass on Leopold Kronecker, in a letter to Sofia Kovalevskaya, 27 August 1883

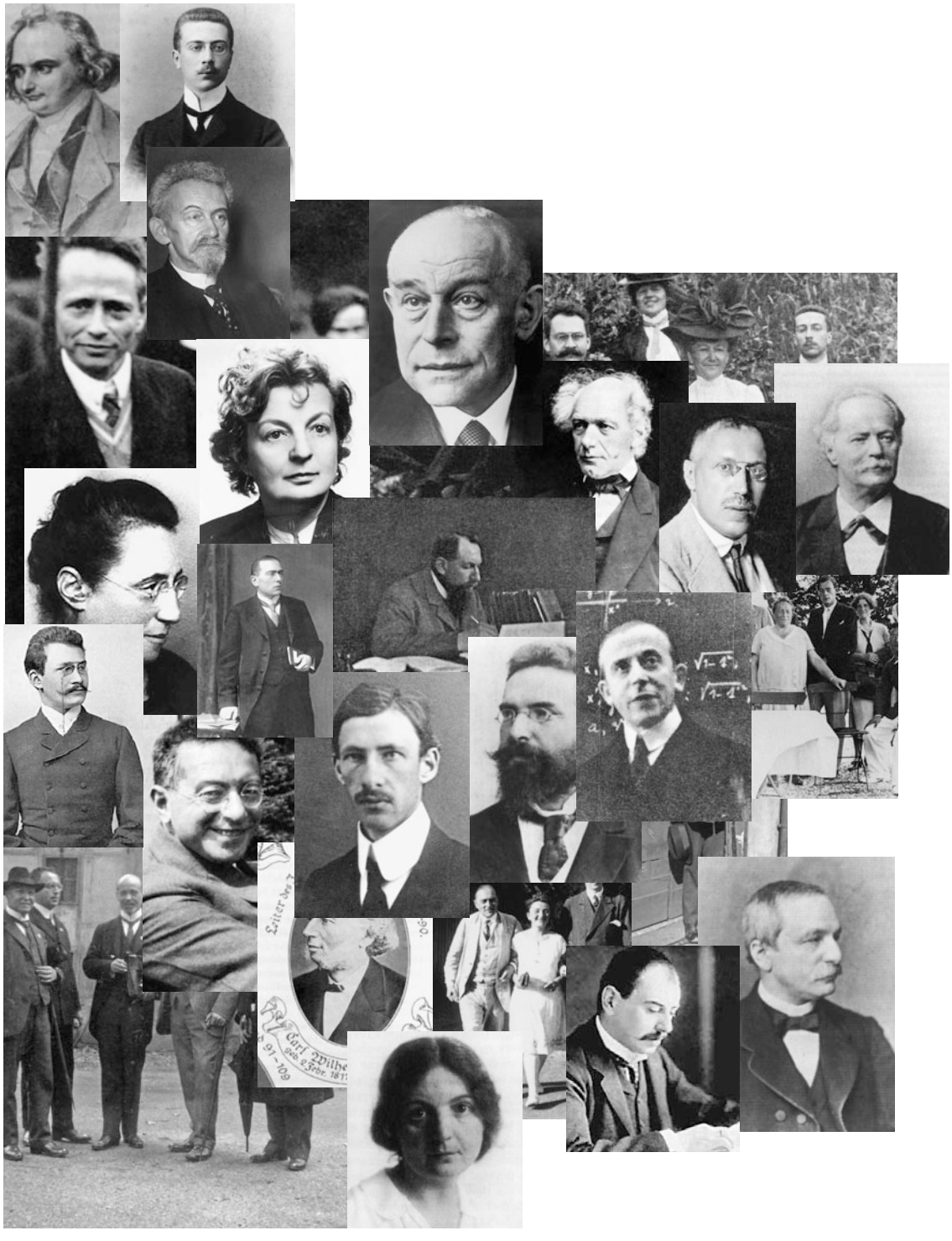
In addition, there is a defect that can be found among many highly educated people, specifically among those with Semitic roots: they do not have sufficient imagination (I should probably say intuition), and it is true that a mathematician who is not something of a poet will never be an accomplished mathematician.

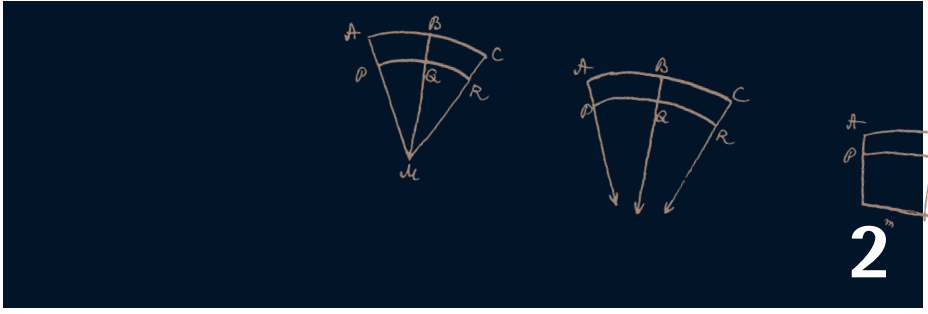
53 See (Mehrtens 2004).

The situation changed completely when anti-Semitism became state doctrine in Nazi Germany. When Ludwig Bieberbach (1886-1982), a Berlin professor and an acknowledged expert on function theory, and Kurt Vogel (1888-1985), a teacher and historian of mathematics in Munich, published their damaging articles on the role of Jews in mathematics, they were written and read in a totally different context.[54] To downplay or to attack the role of Jewish mathematicians no longer meant merely repeating a stereotype – it meant bringing aggressive and racially-motivated Nazi propaganda into their own field of mathematics. Since both authors were acknowledged experts in their particular fields, they inflicted great intellectual damage and joined the ranks of those who contributed to legitimizing the ever more radical persecution of their Jewish colleagues and neighbors.

Annette Vogt

54 See (Bieberbach 1934, 1940) and (Vogel 1939).





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People

The prosopographic data collected for the exhibition lists dates of birth and death and the places of employment of Jewish mathematicians who were professionally active in the German-speaking world between 1830 and 1935. The list includes all mathematicians who worked at mathematical institutes as professors or Privatdozenten (who had obtained a habilitation, i.e. a formal qualification for lecturing at universities). Moreover, it includes all lecturers and independent researchers without habilitation about whom information was available. It does not include scholars who worked in the private sector, doctoral candidates, assistants, or other lower-level employees. The list also provides an overview of the way in which the presence of Jewish mathematicians in the German higher education landscape evolved over the course of the approximately 150-year period under examination here. The data shows that, once Jews had been granted legal equality, there were more and more Jewish mathematicians at German universities as new generations of young academics joined the field. The list is incomplete, particularly for the years before 1871 and for the first years of the Wilhelmine Empire. The organizers of the exhibition would be grateful for any information about Jewish mathematicians who have not been included.

B. Bergmann et al. (eds.), *Transcending Tradition*

All the mathematicians listed here are from Jewish families. Even though they themselves may not have lived according to the Jewish tradition, this tradition was still present at least in the lives of their parents. The generation of their grandparents, however, could not be taken into account here for lack of data. As a consequence, the list does not include the names of mathematicians who were persecuted by the Nazis because of the religion of their grandparents, such as Ernst Sigismund Fischer (1875-1954), who was dismissed because he had a Jewish grandmother. For the same reason we have not included mathematicians such as the founder of the theory of infinite sets, Georg Cantor (1845-1918), who was a Catholic but whose grandparents were Jewish.

The table is essentially based on four sources. Reinhard Siegmund-Schultze's *Mathematicians Fleeing from Nazi Germany* covers all mathematicians who lost their positions in 1933 or later due to Nazi legislation and who were later persecuted by the Nazis. This survey is largely based on a systematic evaluation of the *List of Displaced German Scholars*,[1] and the author has expanded it with extensive additional archival material.

Siegmund-Schultze's survey includes the names of all the mathematicians who were persecuted by the Nazis as well as the names of men and women forced to flee for political reasons rather than because of their "race". The reason for their expulsion is provided in nearly all cases. An appendix also provides a short list of those mathematicians who did not manage to flee in time and who either died in ghettoes or concentration camps or took their own lives in desperation.

For the period before the persecution, we were able to expand the table with information contained in *Winfried Scharlau's Mathematische Institute in Deutschland 1800-1945*. Most of the biographical details on the mathematicians come from Johann Christian Poggendorff's *Biographisch-literarisches Handwörterbuch zur Geschichte der exakten Naturwissenschaften*.[2] This was supplemented by biographical data from the comprehensive database maintained by the School of Mathematics and Statistics at St. Andrew's College, Scotland.[3]

A brief word on the spelling of individual names. This prosopograhy used, as a rule, the name under which the mathematicians published and taught at a German institution of higher education. Thus, Hilda Geiringer is listed under her hyphenated name, Hilda Pollaczek-Geiringer, the name she used during her time in Berlin as the wife of Felix Pollaczek. János Neumann von Margitta, better known internationally under the name John von Neumann, is listed as Johann von Neumann, the name he used while in Germany.

Abraham A. Fraenkel is the sole exception to this rule. Fraenkel's original first name was Adolf. For obvious reasons, he used this name only as a second given name after his emigration to Israel, and it is seldom found written out in full. We yield to Fraenkel's decision on this.

1 See (Siegmund-Schultze 2008). The *List of Displaced German Scholars* was first published in London in 1936 (List 1936). References in this exhibition are to (Strauss et al. 1987).

2 See (Scharlau 1989), (Poggendorf 1884).

3 This database can be found online at www-history.mcs.st-andrews.ac.uk (June 2011).

Jewish mathematicians in the German states 1780–1933

Name	Dates	Active in	After 1933	Membership in DMV
Baer, Reinhold	1902-1979	Freiburg (1926-1928), Halle (1928-1933)	emigrated to Great Britain	1928-1939
Behrend, Felix Adalbert	1911-1962	Berlin (1929-1933)	emigrated to Czechoslovakia	
Bergmann, Stefan	1895-1977	Berlin (1930-1933)	emigrated to the Soviet Union	1923-1936
Bernays, Paul	1888-1977	Zürich (1912-1917), Göttingen (1919-1933)	returned to Switzerland	from 1918
Bernstein, Felix	1878-1956	Halle (1907), Göttingen (1907-1934)	emigrated to the USA	1899-1939
Blumenthal, Otto	1876-1944	Göttingen (1901-1905), Marburg (1905) Aachen (1905-1933)	died in Theresienstadt	1900-1938
Bochner, Salomon	1899-1982	München (1926-1933)	emigrated to the USA	1921-1935
Borchardt, Carl Wilhelm	1817-1880	Berlin (1848-1880)		
Brauer, Alfred Theodor	1894-1985	Berlin (1928-1935)	emigrated to the USA	1925-1938, 1965-1985
Brauer, Richard	1901-1977	Berlin, Königsberg (1925-1933)	emigrated to the USA	1925-1939
Breuer, Samson	1891-1974	Karlsruhe (1921-1933), Frankfurt (1924-1929)	emigrated to Palestine	1920-1938
Cohn, Arthur	1894-1940	Berlin	emigrated to Palestine	1924-1934
Cohn-Vossen, Stefan	1902-1936	Göttingen (1929-1930), Köln (1930-1933)	emigrated to the Soviet Union	
Courant, Richard	1888-1972	Münster (1920), Göttingen (1912-1933)	emigrated to the USA	1909-1935, 1950-1972
Dehn, Max	1878-1952	Frankfurt (1921-1935)	emigrated to Norway	1900-1938
Eisenstein, Ferdinand Gotthold	1823-1852	Berlin (1847-1852)		
Epstein, Paul	1871-1939	Straßburg (1903-1918), Frankfurt (1919-1935)	suicide in 1939	1900-1934
Feller, Willy	1906-1970	Kiel (1928-1933)	emigrated to Denmark	1930-1935
Fenchel, Werner	1905-1988	Göttingen (1928-1933)	emigrated to Denmark	1928-1938
Fraenkel, Abraham A.	1891-1965	Marburg (1916-1928), Kiel (1928-1929)	emigrated to Palestine	1914-1939
Fuchs, Immanuel Lazarus	1833-1902	Berlin (1865-1866, 1882-1902), Greifswald (1867-1874), Göttingen (1875), Heidelberg (1875-1882)		1891-1902
Fuchs, Maximilian Ernst Richard	1873-1945	Berlin (1922-1938)		1902-1945
Goldschmidt, Benjamin	1807-1851	Göttingen (1833-51)		
Gordan, Paul	1837-1912	Gießen (1864-1874), Erlangen (1874-1910)		1891-1912
Gumbel, Emil Julius	1891-1966	Heidelberg (1923-1932)	emigrated to France	1929-1935
Gundelfinger, Sigmund	1846-1910	Tübingen (1869-1879), Darmstadt (1879-1907)		1891-1910
Hahn, Hans	1879-1934	Bonn (1916-1920), Wien (1921-1934)		1903-1934
Hamburger, Hans	1889-1956	Berlin (1918-1924), Köln (1924-1935)	emigrated to Great Britain	1920-1938, 1950-56
Hamburger, Meyer	1838-1903	Berlin (1879-1903)		1891-1903
Hartogs, Friedrich	1874-1943	München (1905-1935)	suicide in 1943	1904-1939
Hausdorff, Felix	1868-1942	Leipzig (1895-1910), Bonn (1910-1913, 1921-1935), Greifswald (1913-1921)	suicide in 1942	1896-1938
Heilbronn, Hans	1908-1975	Göttingen (1930-1933)	emigrated to Great Britain	
Hellinger, Ernst	1883-1950	Marburg (1909-1914), Frankfurt (1914-1936)	emigrated to the USA	1907-1938
Hensel, Kurt	1861-1941	Berlin (1886-1901), Marburg (1901-1930)		1891-1939
Hilb, Emil	1882-1929	Erlangen (1908), Würzburg (1908-1929)		1906-1929
Hopf, Heinz	1894-1971	Berlin (1926-1931), Zürich (1931-1971)		from 1925
Hopf, Ludwig	1884-1939	Aachen (1914-1934)	emigrated to Ireland	1925-1939
Hurwitz, Adolf	1859-1919	Königsberg (1884-1892), Zürich (1892-1919)		1891-1919
Jacobi, Carl Gustav Jacob	1804-1851	Königsberg (1825-1843), Berlin (1844-1848)		
Jacobsthal, Ernst Erich	1882-1965	Berlin (1913-1934)	emigrated to Norway	1906-1939
Joachimsthal, Ferdinand	1818-1861	Berlin (1845-1853), Halle (1853-1856), Breslau (1856-1861)		
Kármán, Theodore von	1881-1963	Aachen (1913-1933)	emigrated to the USA	1909-1936
Königsberger, Leo	1837-1921	Greifswald (1864-1869), Heidelberg (1869-1875, 1884-1914), Dresden (1875-1877), Wien (1877-1884)		1891-1921
Korn, Arthur	1870-1945	München (1895-1914), Berlin (1914-1935)	emigrated to the USA	1907-1939
Kronecker, Leopold	1823-1891	Berlin (1855-1891)		1890-1891
Landau, Edmund	1877-1938	Berlin (1901-1908), Göttingen (1909-1934)		1899-1938
Landsberg, Georg	1865-1912	Heidelberg (1893-1904), Breslau (1904-1906), Kiel (1906-1912)		1894-1912

Levi, Friedrich Wilhelm	1888-1966	Leipzig (1920-1935)	emigrated to India	1919-1966
Lewy, Hans	1904-1988	Göttingen (1927-1933)	emigrated to the USA	
Lichtenstein, Leon	1878-1933	Berlin (1919-1920), Münster (1920-1922), Leipzig (1922-1933)	emigrated to Poland	1909-1933
Liebmann, Karl Otto Heinrich	1874-1939	Leipzig (1899-1910), München (1910-1920), Heidelberg (1920-1935)		1897-1939
Lipschitz, Rudolf Otto Sigismund	1832-1903	Berlin (1857-1862), Bonn (1862-1864), Breslau (1864-1903)		1892-1903
Loewy, Alfred	1873-1935	Freiburg (1902-1933)		1897-1935
London, Franz	1863-1917	Breslau (1889-1904), Bonn (1904-1916)		1891-1917
Mahler, Kurt	1903-1988	Göttingen (1925-1933), Königsberg (1933-1934)	emigrated to Great Britain	
Minkowski, Hermann	1864-1909	Bonn (1887-1894), Königsberg (1894-1896), Zürich (1896-1902), Göttingen (1902-1909)		1891-1909
Mises, Richard von	1883-1953	Brünn (1908-1909), Straßburg (1909-1914), Berlin (1919-1933)	emigrated to Turkey	1907-1939
Neumann, Johann von	1903-1957	Berlin (1926-1929), Hamburg (1929-1930)	emigrated to the USA in 1930	1927-1935
Noether, Emmy	1882-1935	Göttingen (1915-1933)	emigrated to the USA	1909-1935
Noether, Fritz	1884-1941	Karlsruhe (1918-1922), Breslau (1922-1933)	killed in Soviet Union	1911-1941
Noether, Max	1844-1921	Erlangen (1875-1919)		1891-1921
Ostrowski, Alexander	1893-1986	Göttingen (1923-1925), Basel (1926-1958)		1921-1986
Pasch, Moritz	1843-1930	Gießen (1873-1911)		1891-1930
Pollaczek, Felix	1892-1981	Berlin (1921-1933)	emigrated to France	1921-1934
Pollaczek-Geiringer, Hilda	1893-1973	Berlin (1927-1933)	emigrated to Turkey	1921-1939
Prager, Wilhelm	1903-1980	Göttingen (1929-1932), Karlsruhe (1932-1933)	emigrated to Turkey	
Pringsheim, Alfred	1850-1941	München (1879-1922)	emigrated to Switzerland	1891-1941
Reissner, Hans Jacob	1874-1967	Aachen (1906-1913), Berlin (1913-1935)	emigrated to the USA	1920-1936
Remak, Robert	1888-1942	Berlin (1929-1933)	killed	1918-1939
Rosanes, Jakob	1842-1922	Breslau (1865-1911)		1891-1922
Rosenhain, Johann Georg	1816-1887	Breslau (1844-1848), Wien (1849-1856), Königsberg (1857-1885)		
Rosenthal, Arthur	1887-1959	München (1912-1922), Heidelberg (1922-1935)	emigrated to the USA	1909-1938
Rogosinski, Werner	1894-1964	Königsberg (1923-1936)	emigrated to Great Britain	1923-1938
Rothe, Erich	1895-1988	Breslau (1928-1935)	emigrated to the USA	1928-ca. 1939
Saalschütz, Louis	1835-1913	Königsberg (1875-?)		1891-1913
Schapira, Hermann	1840-1898	Heidelberg (1883-1898)		1891-1898
Schlesinger, Ludwig	1864-1933	Berlin (1889-1896), Bonn (1897), Gießen (1911-1933)		1891-1933
Schoenflies, Arthur	1853-1928	Göttingen (1891-1899), Königsberg (1899-1911), Frankfurt (1911-1922)		1891-1928
Schur, Issai	1875-1941	Berlin (1903-1913, 1916-1934), Bonn (1913-1916)	emigrated to Palestine	1901-1938
Schwarzschild, Karl	1873-1916	Göttingen (1901-1909), Potsdam (1909-1914)		1903-1916
Simon, Max	1844-1918	Straßburg (1871-1912)		1891-1918
Steinitz, Ernst	1871-1928	Berlin (1897-1910), Breslau (1910-1920), Kiel (1920-1928)		1897-1928
Stern, Moritz Abraham	1807-1894	Göttingen (1829-1884)		1891-1894
Sternberg, Wolfgang	1887-1953	Breslau (1929-1934)	emigrated to the USA	1918-1926
Szász, Otto	1884-1952	Frankfurt (1914-1933)	emigrated to the USA	1912-ca. 1939
Szegö, Gábor	1895-1985	Berlin (1921-1926), Königsberg (1926-1934)	emigrated to the USA	1921-1939
Taussky, Olga	1906-1995	Göttingen (1931-1934)	emigrated to the USA	1930-1939
Toeplitz, Otto	1881-1940	Göttingen (1906-1913), Kiel (1913-1928), Bonn (1928-1935)	emigrated to Palestine	1906-1938
Weinstein, Alexander	1897-1979	Zürich (1927), Hamburg (1928), Breslau (1928-1933)	emigrated to France	1928-1936
Wintner, Aurel	1903-1958	Leipzig (1927-1929)	emigrated to the USA in 1930	1931-1937

The personal data we collected is presented in the context of milestones in Germany's political history in order to show the impact of changes in legal and political conditions on the activities of Jewish mathematicians.

The exhibition will be examining the following periods of German history: a) the period before the founding of the Wilhelmine Empire in 1871, b) the years of the Wilhelmine Empire, from 1871 to 1919, and c) the Weimar Republic. As a result, it is possible to compare three generations of mathematicians. The first period represents the phase of Jewish-German life in which advancement was sought through education, and when legal emancipation was accompanied by social acceptance and general acculturation. In the second phase, the political rights of Jews were legally established and consolidated. The last phase culminated in expulsion and extermination.

The maps below depict the numbers of Jewish mathematicians at German universities during the three time periods under consideration. There are also three different graphic representations on these maps: universities with at least one Jewish mathematician are marked with a small red square; universities employing a minimum of two Jews in full professorships are represented by a medium-sized square; and universities with at least 10 Jewish mathematicians, of which at least two had full professorships, are designated with a large square. In cities like Berlin and Munich, which boasted both a university and a technical university, our entry takes into account the number of Jewish mathematicians at both institutions.

The maps reveal that there were clear changes in German higher education over the years with regard to the presence of Jewish mathematicians. It is immediately clear that the number of universities employing them rose strongly. In the 90 years between 1780 and 1870, during which each of the individual German states had its own legal regulations for the employment of Jews, the number of universities with Jewish mathematicians on their staff remained relatively small. Moreover, five of the eight universities that employed Jewish mathematicians are situated in the same state, the Kingdom of Prussia. This may have less to do with a progressive legal situation in Prussia, and more with the fact that Prussia as the largest German state was home to the greatest number of universities.

During the Wilhelmine Empire, once legal regulations across the empire had been standardized, the number of universities with Jewish mathematicians increased dramatically. The largest number of Jewish mathematicians was in Berlin, which had the largest university in the Wilhelmine Empire. Königsberg and Göttingen were also prominent centers.

During the Weimar Republic, the number of Jewish mathematicians remained relatively stable. Göttingen and Berlin still clearly represented centers of mathematical activity. It has been suggested that Jewish scientists were frequently marginalized in their research areas and began their scientific careers in small, less important universities; in other words, they were geographically as well as socially marginalized. This hypothesis cannot be confirmed, at least not for mathematics in the Weimar Republic.[4]

4 On the hypothesis of the marginalization of Jewish scientists, see. e.g. (Preston 1971) and (Volkov 2000).

Berlin, as the capital and home to the largest German university, and Göttingen, as the center of the mathematical world at the time, suggest an argument to the contrary. The chance for younger mathematicians to be promoted, regardless of their religion, was quite high at these locations.

However, the maps also show that at all times in the German states, and later in unified Germany, there were some universities that employed no Jewish mathematicians at all, for example the institutes of technology in Stuttgart or Hanover.

Alongside absolute numbers of Jewish mathematicians employed at universities, we also attempted to provide relative numbers.[5] Based on information provided by Scharlau and the information gleaned from prosopographic data for the periods 1870-1900, 1900-1914 and 1914-1933, as well as for the year 1933 itself, we were able to generate the number of Jewish professors occupying full professorships in comparison to all full professorships in mathematics. Unfortunately, we were unable to include professors holding Extraordinariat positions in these lists since, as Scharlau mentions, their numbers fluctuated considerably and were hard to come by for certain universities.

Thirty-seven institutions of higher education (universities, technical universities, mining colleges) were examined. Twenty-two of them employed Jewish mathematicians as full professors. The total number of full professors was as follows:
in 1870: 51
in 1900: 77
in 1914: 90
in 1933: 94

In the periods between these years, these are the numbers of full professorships occupied at least temporarily by Jewish mathematicians:
1870-1900: 11
1900-1914: 17
1914-1933: 28

In 1933, twenty of the 94 full professorships were still occupied by Jews.

Birgit Bergmann

5 For more relative data about the Weimar Republic, e.g. on first appointments of Jewish mathematicians, see (Siegmund-Schultze 2008).

Before the Wilhelmine period 1780–1870

The following maps show, for all three time periods, where Jewish mathematicians lived and worked. Full professors are indicated in bold print.

The maps do not always accurately reproduce the borders of countries neighboring Germany.

BERLIN, UNIVERSITY
Borchardt, Carl Wilhelm
Eisenstein, Ferdinand Gotthold
Fuchs, Immanuel Lazarus
Jacobi, Carl Gustav Jacob
Joachimsthal, Ferdinand
Kronecker, Leopold

BONN
Lipschitz, Rudolf Otto Sigismund

BRESLAU, UNIVERSITY
Joachimsthal, Ferdinand
Lipschitz, Rudolf Otto Sigismund
Rosanes, Jakob
Rosenhain, Johann Georg

GIESSEN
Gordan, Paul
Pasch, Moritz

GÖTTINGEN
Goldschmidt, Benjamin
Stern, Moritz Abraham

GREIFSWALD
Fuchs, Immanuel Lazarus
Königsberger, Leo

HALLE
Joachimsthal, Ferdinand

HEIDELBERG
Königsberger, Leo

KÖNIGSBERG
Saalschütz, Louis
Jacobi, Carl Gustav Jacob
Rosenhain, Johann Georg

During the Wilhelmine period 1870–1919

AACHEN
Blumenthal, Otto
Hopf, Ludwig
Kármán, Theodore von
Reissner, Hans

BERLIN, UNIVERSITY
Borchardt, Carl Wilhelm
Fuchs, Immanuel Lazarus
Hensel, Kurt
Kronecker, Leopold
Landau, Edmund
Schlesinger, Ludwig
Schur, Issai

BERLIN, TH
Fuchs, Ernst Richard
Hamburger, Meyer
Jacobsthal, Ernst Erich
Korn, Arthur
Lichtenstein, Leon
Steinitz, Ernst

BONN
Hahn, Hans
Hausdorff, Felix
Lipschitz, Rudolf Otto Sigismund
London, Franz
Minkowski, Hermann
Schlesinger, Ludwig
Schur, Issai

BRESLAU, UNIVERSITY
Landsberg, Georg
London, Franz
Rosanes, Jakob
Steinitz, Ernst

BRESLAU, TH
Dehn, Max
Steinitz, Ernst

DARMSTADT
Gundelfinger, Sigmund

DRESDEN
Königsberger, Leo

ERLANGEN
Gordan, Paul
Hilb, Emil
Noether, Max

FRANKFURT
Hellinger, Ernst
Schoenflies, Arthur

FREIBURG
Loewy, Alfred

GIESSEN
Gordan, Paul
Pasch, Moritz
Schlesinger, Ludwig

GÖTTINGEN
Bernstein, Felix
Fuchs, Immanuel Lazarus
Hurwitz, Adolf
Landau, Edmund
Minkowski, Hermann
Schoenflies, Arthur
Schwarzschild, Karl
Stern, Moritz Abraham
Toeplitz, Otto

GREIFSWALD
Fuchs, Immanuel Lazarus
Hausdorff, Felix

HALLE
Bernstein, Felix

HEIDELBERG
Fuchs, Immanuel Lazarus
Königsberger, Leo
Landsberg, Georg
Noether, Max
Schapira, Hermann

KARLSRUHE
Noether, Fritz

KIEL
Dehn, Max
Landsberg, Georg
Toeplitz, Otto

KÖNIGSBERG
Hurwitz, Adolf
Minkowski, Hermann
Saalschütz, Louis
Schoenflies, Arthur
Rosenhain, Johann Georg

LEIPZIG
Hausdorff, Felix
Liebmann, Karl Otto Heinrich

MARBURG
Fraenkel, Abraham A.
Hellinger, Ernst
Hensel, Kurt

MÜNCHEN, UNIVERSITY
Hartogs, Friedrich
Pringsheim, Alfred
Rosenthal, Arthur
Schwarzschild, Karl

MÜNCHEN, TH
Liebmann, Karl Otto Heinrich

MÜNSTER
Dehn, Max

STRASSBURG
Epstein, Paul
Mises, Richard von
Simon, Max

TÜBINGEN
Gundelfinger, Emil

WÜRZBURG
Hilb, Emil

During the Weimar Republic 1919–1933

AACHEN
Blumenthal, Otto
Hopf, Ludwig
Kármán, Theodore von

BERLIN, UNIVERSITY
Behrend, Felix Adalbert
Bergmann, Stefan
Brauer, Alfred
Cohn, Arthur
Hamburger, Hans
Hopf, Heinz
Mises, Richard von
Neumann, Johann von
Pollaczek, Felix
Pollaczek-Geiringer, Hilda
Remak, Robert
Schur, Issai
Szegö, Gábor

BERLIN, TH
Hamburger, Meyer
Jacobsthal, Ernst Erich
Levin, Victor
Sadowski, Michael

BRESLAU, UNIVERSITY
Sternberg, Wolfgang
Weinstein, Alexander

BRESLAU, TH
Dehn, Max
Noether, Fritz
Rothe, Erich
Steinitz, Ernst

BONN
Hahn, Hans
Hausdorff, Felix
Toeplitz, Otto

DRESDEN
Mises, Richard von

ERLANGEN
Noether, Max

FRANKFURT
Breuer, Samson
Dehn, Max
Epstein, Paul
Hellinger, Ernst
Schoenflies, Arthur
Szász, Otto

FREIBURG
Baer, Reinhold
Loewy, Alfred

GIESSEN
Schlesinger, Ludwig

GÖTTINGEN
Bernays, Paul
Bernstein, Felix
Cohn-Vossen, Stefan
Courant, Richard
Feller, Willy
Fenchel, Werner
Heilbronn, Hans
Landau, Edmund
Lewy, Hans
Mahler, Kurt
Neumann, Johann von
Noether, Emmy
Ostrowski, Alexander
Prager, Wilhelm
Taussky, Olga

GREIFSWALD
Hausdorff, Felix

HALLE
Baer, Reinhold

HAMBURG
Ostrowski, Alexander
Weinstein, Alexander

HEIDELBERG
Gumbel, Emil
Liebmann, Karl Otto Heinrich
Rosenthal, Arthur
Sternberg, Wolfgang

KARLSRUHE
Breuer, Samson
Noether, Fritz

KIEL
Feller, Willy
Fraenkel, Abraham A.
Steinitz, Ernst
Toeplitz, Otto

KÖLN
Cohn-Vossen, Stefan
Hamburger, Hans

KÖNIGSBERG
Brauer, Richard
Rogosinski, Werner
Szegö, Gábor

LEIPZIG
Levi, Friedrich
Lichtenstein, Leon
Wintner, Aurel

MARBURG
Fraenkel, Abraham A.
Hensel, Kurt

MÜNCHEN, UNIVERSITY
Bochner, Salomon
Hartogs, Friedrich
Pringsheim, Alfred
Rosenthal, Arthur

MÜNCHEN, TH
Liebmann, Karl Otto Heinrich

MÜNSTER
Courant, Richard
Lichtenstein, Leon

WÜRZBURG
Hilb, Emil

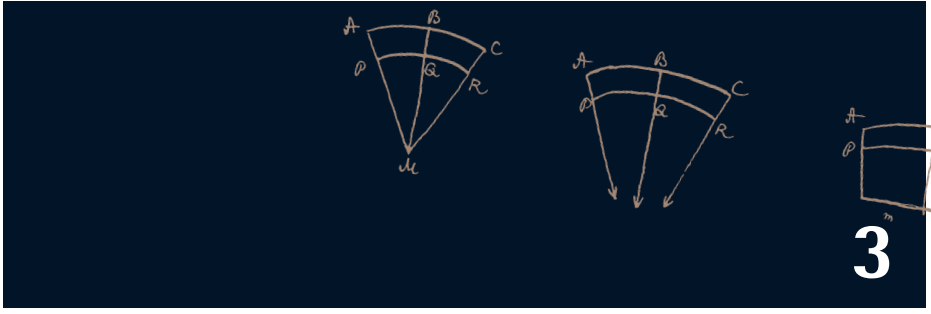
Many Jewish mathematicians were also active at other German-speaking universities in the late 19th and early 20th centuries but could not be included here. Information on three cities, however, is provided here as an example.

PRAG
Bers, Lipman (1914-1993)
Berwald, Ludwig (1883-1942)
Löwner, Karl (1893-1968)
Pick, Georg (1859-1942)

ZÜRICH
Hopf, Heinz (1894-1971)
Hurwitz, Adolf (1859-1919)
Minkowski, Hermann (1864-1909)
Weinstein, Alexander (1897-1979)

WIEN
Hahn, Hans (1879-1934)
Helly, Eduard (1884-1943)
Königsberger, Leo (1837-1921)
Mayer, Walther (1887-1948)
Mises, Richard von (1883-1953)
Pollaczek-Geiringer, Hilda (1893-1973)
Szegö, Gábor (1895-1985)
Tauber, Alfred (1866-1942)
Taussky, Olga (1906-1995)

Rebecca Dirichlet, née Mendelssohn



3

Berlin

$$f(x) = f(x\sigma)\cdot\left(1-\frac{\lambda\sigma x}{1-\sigma x}\right)$$

$$= f(x\sigma^2)\cdot\left(1-\frac{\lambda\sigma x}{1-\sigma x}\right)\left(1-\frac{\lambda\sigma^2 x}{1-\sigma^2 x}\right) = \dots$$

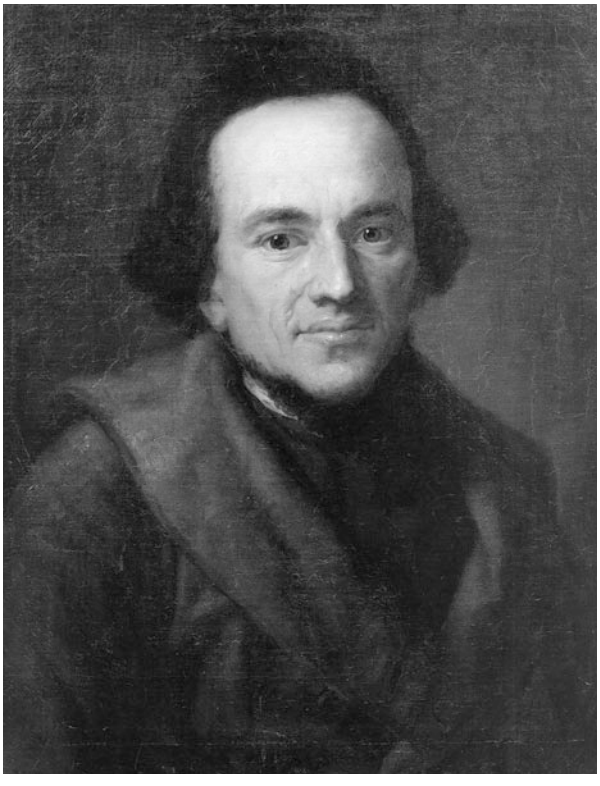
$$f(x) = \prod_{n=1}^{\infty}\left(1-\frac{\lambda\sigma^n x}{1-\sigma^n x}\right) = \prod_{n=1}^{\infty}[1-(\lambda+1)\sigma^n x] : \prod_{n=1}^{\infty}(1-\sigma^n x)$$

B. Bergmann et al. (eds.), *Transcending Tradition*

Moses Mendelssohn and his family – Haskalah and mathematics

Several generations of the Mendelssohn family left an indelible imprint on mathematical life in Berlin. Moses Mendelssohn (1729-1786), whose name is inextricably linked with the history of the Haskalah, worked and published in the fields of philosophy, history and mathematics.[1] Between 1755 and 1763, Mendelssohn wrote four texts of historical interest in the field of mathematics. "Über die Empfindungen" [On sentiments] (1755), "Gedanken von der Wahrscheinlichkeit" [Thoughts on probability] (1756), "Versuch, eine vollkommen gleichschwebende Temperatur durch die Construction zu finden" [Attempt to establish equal temperature by geometrical construction] (1761) and "Abhandlung über die Evidenz in Metaphysischen Wissenschaften" [On evidence in metaphysical sciences] (1763).[2] Alexander Altmann referred to the paper "Thoughts on Probability" as a "Kaffeehaus-Produkt", probably because it was read at one of the weekly meetings of the scholarly *Kaffeehaus*, a society founded in Berlin in 1755.[3] Members of this society included mathematician Johann Albrecht Euler (1734-1800) and physicist Franz Ulrich Theodor Aepinus (1724-1802), and Mendelssohn discussed his essay with Aepinus in particular. With "On Evidence in Metaphysical Sciences" Mendelssohn won a first prize from the Royal Prussian Academy of Sciences, ahead of Immanuel Kant (1724-1804), who was awarded second prize. The Mendelssohn paper primarily addresses the relative value of metaphysical evidence as measured against mathematical proof.[4]

Moses Mendelssohn



Two granddaughters of Mendelssohn married mathematicians. In 1840, Nathan Mendelssohn's daughter Ottilie (1819-1848) married Ernst Eduard Kummer (1810-1893). Rebecca Mendelssohn (1811-1858), the younger daughter of banker Abraham Mendelssohn Bartholdy (1776-1835), married Johann Peter Gustav Lejeune Dirichlet (1805-1859) in 1832.

Max Lenz points out that through his wife Rebecca, Dirichlet gained access to a circle "which culminated in the Berlin society of the 1830s and a reflection of which we have in the Mendelssohn siblings' letters."[5] Rebecca's importance as a salonnière and patron of the arts, as a supporter of the 1848 revolution and as a motherly friend to her nephew Sebastian Hensel (1830-1898), the only son of her sister Fanny, has been the subject of detailed research within the scope of Mendelssohn studies.[6]

With her parents' home as a model, Rebecca (also spelled Rebecka or Rebekka) Dirichlet knew how to transform her homes, in Berlin as well as Göttingen, into popular meeting places for scientists and artists. Although baptized as a child, Rebecca remained conscious of her Jewish roots and referred ironically to the name "Bartholdy", which her father had adopted when he was baptized in 1822. She often signed her letters

1 Alexander Altmann (1906-1987), Mendelssohn scholar and long-time editor of the anniversary edition of Mendelssohn's works, was the first to examine Mendelssohn's mathematical works. His 1973 Mendelssohn biography still ranks as a standard work. See (Altmann 1973).
2 See (Lausch 1990: 84ff.).
3 See (Lausch 1990: 84, n. 45).
4 Altmann wrote a 140-page text to accompany this treatise in the anniversary edition of Mendelssohn's works. See (Lausch 1990: 86f.).
5 (Lenz 1910: 379), in volume 2, 1st half. Max Lenz refers primarily to Ernst Eduard Kummer's (1860) tribute; a selection of letters from the Mendelssohns, particularly those of Fanny and Felix, were available as of 1879 in Sebastian Hensel's biography of the family.
6 On Rebecca Dirichlet, see (Hensel 1879); additionally, (Büchter-Römer 2005), (Feilchenfeldt 1979, 1986), (Kühn 1999), (Lausch 1990) and (Richter 1997: 25-28).

"Rebecca Mendelssohn Meden Bartholdy" – *meden* being Greek for "and not". She was also considered a philological expert in Greek and Latin, languages which she had learned with the help of private tutors and maintained through regular reading her whole life.

Fanny, Felix, Rebecca and Paul Mendelssohn Bartholdy grew up in an intellectual milieu and in a family that exposed them to both Jewish and Christian values and traditions. They learned how to blend elements of the Jewish and Christian religions, to remain tolerant and preserve their own roots with pride. In the comprehensive education that all four children received, moral issues and the value of living according to their conscience held a high status. Rebecca Dirichlet also learned from her mother how to lead a sociable house in which music, literature and conversation flourished.[7]

Rebecca Dirichlet, née Mendelssohn

Peter Gustav Lejeune Dirichlet

7 On the subject of Jewish salons, see (Hertz 1991).

Diary entry of Rahel Varnhagen von Ense, 24 October 1849

> At the Dirichlets' this evening. A truly happy evening! Nobody present besides the two spouses and their oldest son Walter. Rebecca read to me from her brother Felix's letters narrating his travels; from Weimar, Munich, Vienna, Venice, Rome. The rich past of this noble and happy family came alive before me. The wonderful parents, Abraham and Lea; the talented and loving children! Demonstrating a rare maturity, 21-year-old Felix writes (1830) the most beautiful letters demonstrating his all-around education and especially his charming liveliness. Like the brother, however, the sister reading aloud has also left a great impression on me. I observed her with genuine pleasure. Her reading and relating showed her noble, rich soul, her educated spirit, her pure mind in its entirety. I went home around half past ten.[8]

A great deal about the family history can also be gleaned from Rebecca Dirichlet's letters to her nephew Sebastian Hensel, some of it of a quite personal nature, some political.[9] Rebecca Dirichlet was highly interested in politics at a time when this was unusual for women or at least viewed as non-feminine. She welcomed the revolutionary developments of mid-nineteenth-century Europe because, like many Jews, she hoped that change would bring new constitutions as the French Revolution had done and that Jews might finally have the same civil rights as other citizens. Around 1848, democratic groups and parties in several countries of the Austro-Hungarian Empire as well as in the German states and once again in France demanded the overthrow of old government institutions and called for democracy, elections and new constitutions. Many Jews, who until then had not been allowed to participate openly in political activities, now joined the various revolutionary political groups and parties. They published booklets and pamphlets, and spoke at meetings and demonstrations. But the 1848/49 revolution in Prussia and in other German states failed. No democracy was introduced, and even if on paper the new Prussian constitution of 1850 granted civil rights independently of religion, the discrimination of Jews continued in practical life.

Rebecca Dirichlet's letters chronicled the defeat of the 1848 revolution.[10] The Mendelssohn Bartholdy papers, which are kept at the Berlin State Library (Preussische Staatsbibliothek), include some letters from Rebecca to her nephew Sebastian Hensel (1830-1898), who later became the first biographer of his great-grandfather Moses Mendelssohn and his uncle Felix Mendelssohn Bartholdy.

When it became clear that the revolution in Germany would fail, Rebecca Dirichlet wrote to her nephew Sebastian Hensel on 14 February 1849: "But I do not want to write about politics; this is not politics but only a remark. If we lose universal suffrage as well, as it looks now, then every prospect of peaceful advancement has been lost and a second revolution is inevitable in the short or long term. [...] By the way, I shall not talk of politics anymore: I shall limit myself to reading and speculating. However, good philistine friends, whose wildest expectations have been surpassed, drive me to melancholy. I have every respect for sincere absolutists, like your father, who always remain the same and want to know nothing of the new ideas. But that erstwhile liberals should talk themselves into believing that the reactionary party only wishes to preserve their achievements, protect them from anarchy and

8 See (Feilchenfeldt 1979: 72).
9 Hensel later wrote a family history, see (Hensel 1995), originally published in 1879. Most of the letters have apparently survived.
10 See (Büchter-Römer 2005: 301-303).

whatever else banal empty talk has claimed, and that they should therefore unite with the reactionaries rather than support their own party with their moral superiority (if they indeed had any), the one party we can thank for the liberal air the government believes it must lend itself, that is ... let us say nothing more about this. A. Heydemann said yesterday that we had shown that as politicians we are still in diapers. I would have loved to make some indecent retort to that, but I did not do so out of respect for the right of hospitality, and I leave it to your imagination to lay some droppings in the diapers."[11]

And on 12 May 1849, after one of the last revolutionary surges had failed in Dresden, she wrote: "How shall I compose my letters so that they are a drop of balm for you? I could use some balm myself, after every newspaper, every private report from Dresden. It is too, too dreadful. And yet it is only the beginning. The governments' plan is quite clear: all public demonstrations will be disparaged, and the embitterment will be exacerbated to the point where the proletariat strikes back, and this they will meet with canister shot. Unless the setback of the French outside Rome puts a stop to them, and the French government falls, this is the straw I cling to today. Indeed, as much as it is unfortunately true that the Germans needed the French Republic to rise in rebellion, it is also true that none of the governing [...] would have the courage to step forward, as they do now, if the finest of reactionary forces were not now flourishing in France. But it is a straw! A young Frenchman who was just here was beside himself with joy at his people's defeat. The French are said to have done their best there, too: it is reported that they raised a flag on the Académie with an article from the constitution that reads something like: La France, gardienne des libertés de tous les états etc. In the French National Assembly the government ministry has just received a semblance of no-confidence vote, though only a semblance, of course."[12]

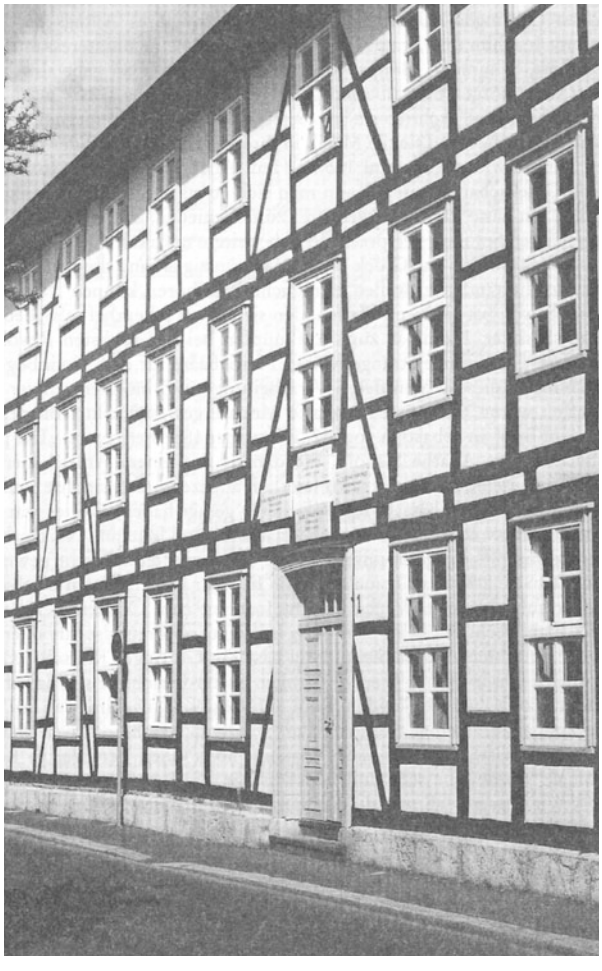
Reports on the 1848 revolution have also been preserved by Moritz Steinschneider, the bibliographer of Jewish scholarship. Letters he exchanged with his fiancée, Auguste Auerbach, reveal something of the situation in Berlin, where he lived, in early 1848 as well as in Prague in March 1848, where she was employed as a private tutor for a wealthy Jewish family. Both Steinschneider and his fiancée hoped that Jews would be granted emancipation and legal equality and, personally, that as a result they would finally be able to marry. In contrast to Berlin, however, anti-Semitic riots broke out in Prague following the revolutionary unrest, and in June 1848 Auguste Auerbach was forced to flee to Vienna with the family with whom she had been living.[13]

In later years, Rebecca Dirichlet naturally also wrote to her nephew Sebastian about her life in Göttingen. She compared life in Berlin and Göttingen and depicted everyday difficulties like problems with workers who were supposed to repair the house.[14] On 11 December 1855 she wrote to her nephew: "It has made me feel quite at home having good music in the house. Yes, indeed, we are feeding these people with the crumbs from our former feasts."[15] Concerts took place regularly on Thursdays in the "*Saal*" [hall] of their house on Mühlenstrasse. In addition, she traveled to Hanover for concerts. She maintained the Jewish tradition of charity, zedakah, as she describes in a letter shortly before Christmas 1856: "The gingerbread and the marzipan have been baked, the last presents will be taken care of today, and nine poor children and six Jewish children will receive presents."[16]

11 Letter from Rebecca Dirichlet to her nephew Sebastian Hensel, 14 February 1849.
12 Letter from Rebecca Dirichlet to her nephew Sebastian Hensel, 12 May 1849.
13 See (Steinschneider 1995: 267-317), exchange of letters between March and October 1848. Following the June 1847 debate in the Prussian parliament on a law that would grant Jews in Prussia partial equality, Moritz Steinschneider had written to Auguste Auerbach, "The parliamentary debates, in which I saw more clearly the wretched condition of humanity – even in the Kingdom of Prussia – did not allow me to share an enthusiasm which my friends also very quickly lost. Some honest men deserve praise as the results do not exactly allow for complaining; but that even a bit of simple reason requires so much theatrical activity is deplorable. For me there has long been no Jewish question, merely a human question." Moritz Steinschneider to Auguste Auerbach, Berlin, 26 June 1847, in (Steinschneider 1995: 203).
14 See the letter shortly after her arrival in Göttingen in 1855, in (Kühn 1999: 148).
15 In (Kühn 1999: 154).
16 In (Kühn 1999: 154).

On the same day on which we buried sweet, little Felix, we suffered yet another hard loss. Jacobi died in the night from Tuesday to Wednesday and, indeed, of the worst illness there is, black pox. I will spare you and myself all additional description of the horrors of the last few days; suffice it to say that he is gone and that the world is poorer for the loss of one mighty spirit and that this mighty spirit, with all of its great faults and virtues, was close to us. His relationship to Dirichlet was so very sweet, the way they sat together for hours, I called it mathematical silence, and the way they certainly did not treat each other gently, and Dirichlet often uttered the bitterest truths to him, and Jacobi understood so well and his great spirit knew to bow before Dirichlet's great character.[17]

Letter from Rebecca Dirichlet to her nephew, Sebastian Hensel, 28 February 1851, on the death of Carl Gustav Jacob Jacobi



House of the Dirichlet family in Göttingen

These excerpts reveal a woman who had been raised in an intellectual atmosphere and who, with her husband, a professor of mathematics, led a socially active and harmonious family life. Although the family was economically well-off, she still retained an awareness of social distress and energetically took part in social life around her – science and culture, music and literature, Enlightenment and politics. Coming from a Jewish family, she upheld Jewish practices and joined in demanding equal rights for Jews in Germany, which kindled her interest in the 1848 revolution.

Two of Fanny Mendelssohn's five grandchildren from Sebastian Hensel, to whom the letters excerpted above were addressed – Paul Hensel (1860-1930) and Kurt Hensel (1861-1941) – became professors. Paul Hensel became a professor of philosophy at the University of Erlangen, and Kurt Hensel a mathematician at Marburg. The latter obtained his habilitation at the University of Berlin and was an Extraordinarius there for ten years before receiving the Marburg appointment. In 1910, he edited the festschrift commemorating Ernst Eduard Kummer. Between 1895 and 1930 he was also the editor of the five-volume *Collected Works* of Leopold Kronecker (the first three were published while Hensel was still in Berlin). Kurt Hensel died in Marburg on 1 June 1941; his wife Gertrude Hahn (1866-1954) survived the Nazi persecutions.[18]

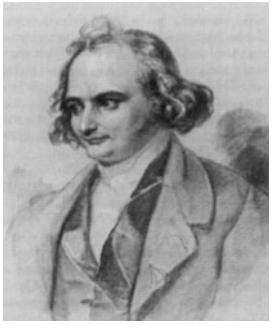
17 See (Feilchenfeldt 1979: 72).

18 No obituary was published for Kurt Hensel until after the end of the Nazi regime; see (Hasse 1949).

The Hensel family's experience resembled that of the Remak family of physicians and mathematicians and the Steinschneider family, which included scholars and jurists. In less than 100 years, the Hensel family had managed to advance and gain acceptance in bourgeois German society, but they had remained subject to persistent anti-Semitic stereotypes and attacks from their non-Jewish surroundings. In these families, whether baptized or loyal to the parents' religion, at least some elements of Jewish tradition were preserved for generations. Jewish life in Germany was a balancing act between tradition and assimilation, and German-Jewish relationships hovered between tolerance and hostility in a scope that remained quite small. The break occurred in 1933. Hopes for mutual respect and tolerance, for realizing the ideals of the Enlightenment, went unfulfilled. On the contrary, in place of Enlightenment came barbarism; rather than acceptance, those affected experienced expulsion, robbery, murder.

Kurt Hensel

Mathematics in Berlin before and during the Wilhelmine Empire



Carl Gustav Jacobi

Ferdinand Gotthold Eisenstein

Carl Wilhelm Borchardt

Leopold Kronecker

The University of Berlin, later called Friedrich Wilhelms University, was established in 1810. It was Prussia's first "reform university". In 1811 another Friedrich Wilhelms University was established in Breslau, and in 1818 the Friedrich Wilhelms University in Bonn was founded. At the same time, Berlin and Breslau were also important centers of Jewish life, and both universities had a relatively high number of Jewish students.[19]

The status of Berlin University as a magnet for mathematicians grew in 1828 with the appointment of Peter Gustav Lejeune Dirichlet (1805-1859).[20] In 1831, Dirichlet became a Full Member of the Royal Prussian Academy of Sciences in Berlin (also known as the Berlin Academy of Sciences).[21] In 1843, Carl Gustav Jacob Jacobi (1804-1851) came to Berlin from Königsberg as a Corresponding Member of the Academy of Sciences. As already mentioned above, the Dirichlet and Jacobi families became close friends. Jacobi's successor at the Academy of Sciences was Gotthold Eisenstein (1823-1852). Just like the Dirichlets, both Jacobi and Eisenstein supported the 1848 revolution.

In 1868, some years following his premature death of tuberculosis, Eisenstein's parents established the Eisenstein scholarship for students of mathematics at Berlin University in his honor.[22] From 1826 onwards Berlin was also a center for publications in the field of mathematics. Beginning in 1855, Carl Wilhelm Borchardt (1817-1880), a Corresponding Member of the Academy of Sciences, employed his wealth first and foremost to support Crelle's *Journal für die reine und angewandte Mathematik*. Although he had earned his habilitation at the University of Berlin in 1848, the only academic function Borchardt was able to obtain was his membership of the Berlin Academy of Sciences.

Dirichlet was succeeded by Ernst Eduard Kummer (1810-1893). Under Kummer, Karl Weierstrass (1815-1897) and Leopold Kronecker (1823-1891), Berlin became a center for mathematical research and teaching, and its importance surpassed even that of Göttingen. Kurt-R. Biermann, the first to systematically examine the history of mathematics and mathematicians at Berlin University, called this flourishing period of mathematics in Berlin the "Kummer, Weierstrass and Kronecker era", underscoring the great influence of these scholars on Berlin's reputation.[23] Kronecker, who was elected Corresponding Member of the Berlin Academy of Sciences in 1861, was not given a full professorship until 1883. He established a "Kronecker Foundation" to support professors' widows and orphans.[24] In 1892, his successor was Ferdinand Georg Frobenius (1849-1917), the teacher and friend of Issai Schur (1875-1941).

Kummer's successor was Immanuel Lazarus Fuchs (1833-1902). In 1865 he wrote his habilitation thesis at Berlin University, where he became Extraordinarius. In 1869 he obtained a professorship at the University of Greifswald, succeeding Leo Königsberger (1837-1921). In 1874, he switched to Göttingen as full professor and in 1875 he once again received an appointment as Königsberger's successor, this time in Heidelberg. He returned to Berlin in 1884. In 1899/1900 he served as President of Friedrich Wilhelms University. In 1892 Hermann Amandus Schwarz (1843-1921),

who had married Kummer's daughter Marie Elisabeth (1842-1921), another descendant of Moses Mendelssohn, in 1868, succeeded his teacher, Karl Weierstrass. In 1917, Erhard Schmidt (1876-1959), who taught at Berlin University until 1950, took over for Schwarz.

At Berlin University, too, Jewish mathematicians encountered anti-Semitism when the discussion turned to their further career development. Obtaining the habilitation itself could be made quite difficult. Appointments as Extraordinarius did not come, or if they did, it was later than for Christian colleagues; professorships fell through even though the person under consideration may have stood at the head of the list. Evidence of rejections for anti-Semitic reasons appears only rarely in official documents. The Prussian Ministry of Culture either did not react to the faculty's suggestion or rejected the petition without providing a reason or citing a lack of finances. The fact that only eight Jewish mathematicians were awarded a habilitation between 1845 and 1902, i.e. a period of 57 years, also suggests latent anti-Semitism.

In 1845 Ferdinand Joachimsthal (1818-1861) became the first Jewish mathematician to habilitate at Berlin University. Fuchs's son-in-law Ludwig Schlesinger (1864-1933) was granted his habilitation in 1889. The next habilitations were awarded twelve years later: in 1901 to Edmund Landau and in 1902 to Issai Schur. Researchers have yet to fully examine the extent to which anti-Semitic motives played a significant role in issues surrounding habilitations and appointments.[25] Between 1845 and 1902, the following mathematicians habilitated:

1845 Ferdinand Joachimsthal, at Breslau University from 1855 onwards

1847 Ferdinand Gotthold Eisenstein, elected Corresponding Member of the Berlin Academy of Sciences in 1852 (Jacobi's successor)

1848 Carl Wilhelm Borchardt, elected Corresponding Member of the Berlin Academy of Sciences in 1855 and editor of Crelle's *Journal* from 1855 to 1880

1865 Immanuel Lazarus Fuchs, Extraordinarius in 1866 to 1869, then full professor at the University of Greifswald and, as of 1884, in Berlin

1886 Kurt Hensel, Extraordinarius in Berlin from 1892 to 1901, then full professor at Marburg University; grand-nephew of Rebecca Dirichlet

1889 Ludwig Schlesinger, Fuchs's son-in-law, at Bonn University from 1896 onwards

1901 Edmund Landau, full professor at Göttingen University from 1909 to 1933

1902 Issai Schur, Extraordinarius at Bonn University in 1913, Extraordinarius in Berlin in 1916, full professor at Berlin University from 1921 to 1933/35

After Schur there was a period of seventeen years in which no Jewish mathematician habilitated at Berlin University.

Immanuel Lazarus Fuchs

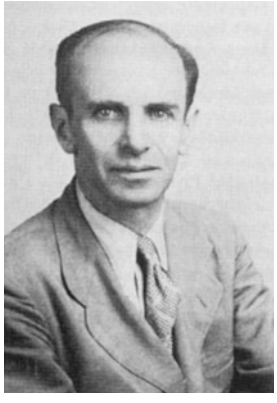
Ludwig Schlesinger

Issai Schur

19 For more on Jewish students at the universities in Berlin and Breslau, see (Richarz 1974).
20 On mathematics at Berlin University, see the standard works by (Biermann 1988) and (Begehr 1998).
21 On the selection of mathematicians for the Berlin Academy, see (Biermann 1960).
22 On the foundations and scholarships at Berlin University, see (Schultz 1994).
23 See (Biermann 1988).
24 See (Schultz 1994).
25 The following overview was compiled largely from materials in (Biermann 1988) and (Begehr 1998).

Mathematics in Berlin during the Weimar Republic

During the Weimar Republic, Berlin once again became a center for mathematical research and a magnet for many mathematicians, although Göttingen remained the German Mecca of mathematicians and physicists.



Alfred Brauer

Issai Schur

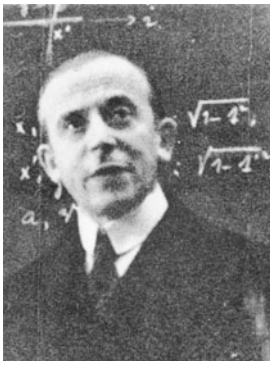
In 1919 Issai Schur finally received a full professorship in Berlin. He went on to found an important school for algebra in Berlin. Between 1917 and 1936, when Schur was irrevocably dismissed from the University of Berlin, he supervised 22 doctoral candidates, four of whom were women. Six other mathematicians who had begun to work on their dissertations under his guidance were unable to finish their work under the Nazi regime. Schur's last assistant was Alfred Brauer (1894-1985), who completed his habilitation in March 1932 and became Privatdozent. Schur's school was broken up immediately after the Nazi takeover, and his students were forced to flee to all corners of the world. Two doctoral students who managed to escape by going into exile were Walter Ledermann (1911-2009) and Menahem Max Schiffer (1911-1997). Schur wrote letters of recommendation to colleagues to help his students find new academic positions in other countries. Alfred Brauer, his assistant, stayed with him as long as possible. After the pogrom of November 1938, the last remaining students tried to emigrate. In 1939 Brauer was able to escape to the USA, while Schur managed to flee via Switzerland to Palestine, where he died in Tel Aviv in 1941.[26]

Issai Schur's doctoral students[27]

1917	Maria Verbeek
1921	Heinz Prüfer
1921	Arthur Cohn
1922	Dora Prölss
1922	Felix Pollaczek
1923	Maximilian Herzberger
1924	Hildegard Ille
1925	Karl Dörge
1926	Richard Brauer
1928	Udo Wegner
1928	Alfred Brauer
1928	Arnold Scholz
1931	Robert Frucht
1932	Wilhelm Specht
1932	Bernhard Neumann
1932	Hans Rohrbach
1933	Richard Rado
1933	Wolfgang Hahn
1935	Helmut Wieland
1935	Karl Molsen
1936	Rose Peltesohn
1936	Feodor Theilheimer

26 On Issai Schur, see (Ledermann; Neumann 2003), (Vogt 1999).
27 Compiled from (Brüning 1998: 23ff.).

The professorship that Leopold Kronecker had held from 1883 to 1891 was given to Schur's teacher and friend Ferdinand Georg Frobenius (1849-1917) in 1892. Frobenius was followed by Constantin Carathéodory (1873-1950) from 1918 to 1919, and in 1921 by Ludwig Bieberbach (1886-1982), who was well-known as a function theorist. Bieberbach later became a fanatic Nazi. As dean of the Faculty of Mathematics and Natural Sciences between 1936 and 1945, he denounced doctoral students and colleagues, among them Issai Schur, his fellow member at the Berlin Academy of Science.[28]



Richard von Mises

Richard von Mises (1883-1953), a specialist on aerodynamics and on the theory of probability, held the newly-established professorship for applied mathematics and became the first director of the Institute for Applied Mathematics at Berlin University, holding this post from 1920/21 until his dismissal in 1933. The only assistant position at his institute was given to Hilda Pollaczek-Geiringer (1893-1973), who finished her habilitation thesis in 1927 and became Privatdozent. Stephan Bergmann (1895-1977) became Privatdozent in 1932, shortly before Hitler's rise to power. All three were dismissed from the university and forced to leave the country. Bergmann emigrated to the USSR, where he received an academic position in Tomsk. This was also where Fritz Noether (1884-1941) found refuge and a position after emigrating from Breslau to the USSR. However, whereas Bergmann managed to escape from the Stalinist terror, Noether became a victim of the Great Purge and was murdered in 1941. Hilda Pollaczek-Geiringer and Emmy Noether were the only two female mathematicians who managed to habilitate – in Berlin in 1927 and Göttingen in 1919 respectively – and held teaching positions at German universities during the Weimar Republic.[29]

Hilda Pollaczek-Geiringer

Whereas only eight Jewish mathematicians had managed to habilitate at Berlin University in the 57 years between 1845 and 1902, nine habilitated and became Privatdozent between 1919 and 1932 alone. This could be taken as a sign of the relatively open and liberal atmosphere at Berlin University during the Weimar Republic. The nine were the mathematicians Hans (Ludwig) Hamburger (1919), Gábor (Gabriel) Szegö (1921), Karl Löwner (1923, later Charles Loewner), Heinz Hopf (1926), Hilda Pollaczek-Geiringer (1925/27), Johann (János) Neumann von Margitta (1927), Robert Remak Jr. (1929), Stephan Bergmann (1932, later Stefan Bergman) und Alfred Brauer (1932).[30]

Among these nine mathematicians who completed their habilitation were two Hungarian émigrés, Gábor Szegö und János Neumann. Stephan Bergmann belonged to the younger generation of East European Jews who migrated to Germany and studied at university. Schur's disciple Alfred Brauer was the last Jewish mathematician who managed to complete his habilitation and become Privatdozent at the University of Berlin before the Nazi regime began. Brauer escaped to the USA in 1939, joining his brother Richard (1901-1977) who had fled in 1933. Eight of the nine Privatdozent mathematicians at the University of Berlin were forced to leave the country after 1933. Robert Remak, who had emigrated to the Netherlands, perished on a transport train from Westerbork concentration camp to Auschwitz.[31]

Annette Vogt

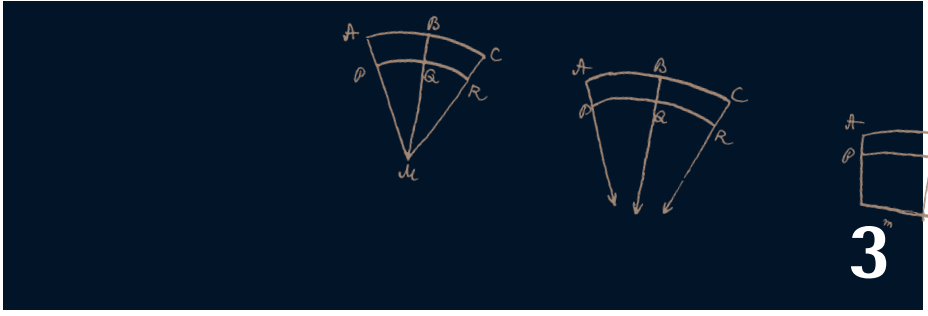
28 On Bierberbach's denunciation of Schur (20 February 1936), see (Vogt 1999: 226ff.). On the denunciation of doctoral candidate Gabriele Neuhäuser, see the documents in Section 7 of this volume.

29 On Hilda Pollaczek-Geiringer-von Mises, see (Binder 1992, 1995), (Richards 1987), (Siegmund-Schultze 1993b), (Vogt 1994).

30 Compiled especially from (Biermann 1988) and (Begehr 1998).

31 See (Vogt 1998).

David Hilbert with friends, students and family. From left to right: Alfréd Haar, Franz Hilbert, Hermann Minkowski, unknown, Käthe Hilbert, David Hilbert, Ernst Hellinger



3

Göttingen

$$f(x) = f(x\sigma)\cdot\left(1-\frac{\lambda\sigma x}{1-\sigma x}\right)$$

$$= f(x\sigma^2)\cdot\left(1-\frac{\lambda\sigma x}{1-\sigma x}\right)\left(1-\frac{\lambda\sigma^2 x}{1-\sigma^2 x}\right) = \dots$$

$$f(x) = \prod_{n=1}^{\infty}\left(1-\frac{\lambda\sigma^n x}{1-\sigma^n x}\right) = \prod_{n=1}^{\infty}[1-(\lambda+1)\sigma^n x] : \prod_{n=1}^{\infty}(1-\sigma^n x)$$

B. Bergmann et al. (eds.), *Transcending Tradition*

Mathematics at Göttingen University

Moritz Abraham Stern (1807-1894)

Göttingen University was a product of the Enlightenment. But although there were occasional appointments of Jewish mathematicians in the second half of the 19th century, a policy of highly selective proportional representation in favor of non-Jewish mathematicians was still in place at the end of the century, creating a barrier that even Jews with the highest qualifications in mathematics could not break through.

Moritz Abraham Stern studied mathematics at Heidelberg and Göttingen. He received his doctorate, written under the guidance of Carl Friedrich Gauss (1777-1855), in 1829 and began teaching at Göttingen as a Privatdozent a year later. After teaching without pay for eight years, Stern was awarded a position as a salaried Privatdozent with an annual salary of 150 talers, which was raised to 300 talers in 1841. At this time an assistant rabbi earned about 800 talers, and a full professor more than 1,500 talers, including honorary fees.[1] Despite growing scientific recognition (he received prizes from the Danish Society of Sciences and from the Belgian Academy) and numerous petitions from the President of Göttingen University to the government of Hanover, Stern was not appointed Extraordinarius because he had not converted to Christianity. He received the appointment only in the second half of 1848.

It was not until more than a decade later and nearly 30 years after receiving his doctorate that he was given a full professorship. He was sworn into office on 9 August 1859 together with Bernhard Riemann (1826-1866), who was then taking over as Johann Peter Gustav Lejeune Dirichlet's successor. Moritz Abraham Stern thus became the first unbaptized Jew to hold a full professorship at a German university. Despite being well-advanced in years, he taught for another two and a half decades, finally retiring in 1884, shortly after Arthur Schoenflies had completed his habilitation. His successor was Felix Klein.

Adolf Hurwitz

Adolf Hurwitz, Arthur Schoenflies, and the appointment policies of Felix Klein

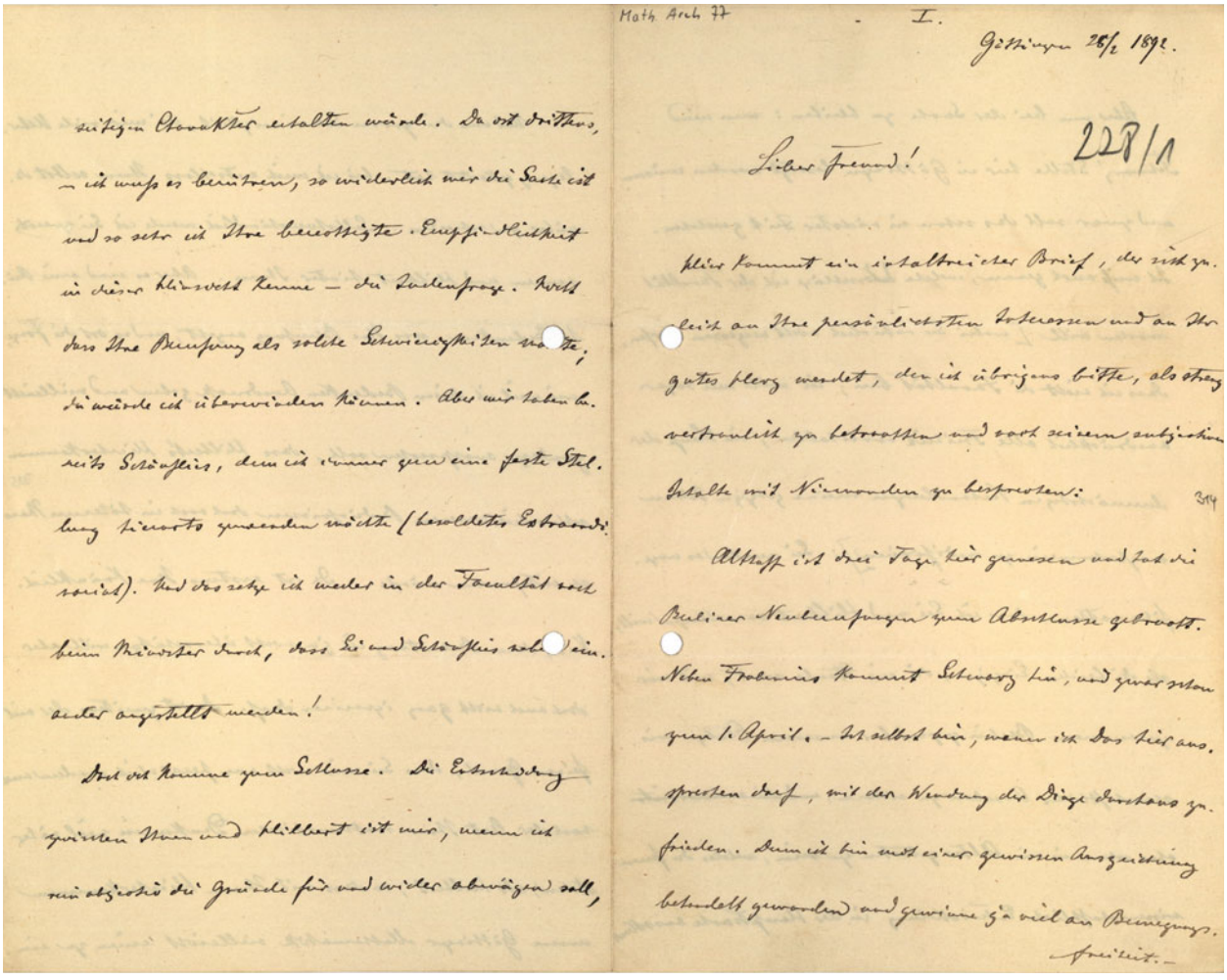
The appointment of Felix Klein (1849–1925) – one of the most important and influential mathematicians at the turn of the 20th century – as Stern's successor at Göttingen University enabled him to expand his organizational activities in his professional field. These included an appointment policy that aimed at bringing together mathematicians from various fields to promote collaboration between them. At this time, he held a particularly high opinion of David Hilbert and Adolf Hurwitz in pure mathematics and Arthur Schoenflies in applied mathematics.[2]

Adolf Hurwitz (1859-1919) came from a northern-German Jewish family that had lived in Braunschweig, Hildesheim and Hanover. His father Solomon Hurwitz had a small factory in Hildesheim. He had lost his wife Elise (née Wertheimer) when Adolf was only three years old. She died of a kidney disease that her son inherited. Hurwitz

attended secondary school in Hildesheim, where his teacher Hermann Schubert, well-known as the creator of the Schubert calculus for enumerative geometry, discovered his talent early on. The broader mathematical world received a first glimpse of this talent when, in his first publication, seventeen-year-old Hurwitz wrote in *Mathematische Annalen* on a controversial equation by Chasles concerning conic section systems.

In 1892, Klein attempted to fill the position vacated by Hermann Amandus Schwarz, who had received an appointment in Berlin, with either Hilbert or Hurwitz. At this point, Hilbert had not yet made much progress in the academic hierarchy (he was still Privatdozent at Königsberg). Klein explained to Hurwitz that he thought he would not manage to get the faculty to approve the latter's application as well as Schoenflies', because both were Jewish. Klein was quite familiar with such resistance, even in relatively enlightened faculties like Göttingen. In a strictly confidential letter appealing to Hurwitz's "most personal interests" and "good heart", Klein listed three factors that might stand in the way of the planned appointment, among them the "Jewish question".

Felix Klein's letter to Adolf Hurwitz, 28 February 1892



Math. Arch. 77 I.

Göttingen 28/2 1892.

228/1

Lieber Freund!

Hier kommt ein inhaltreicher Brief, der sich zu. gleich an Ihre persönlichsten Interessen und an Ihr gutes Herz wendet, den ich übrigens bitte, als streng vertraulich zu betrachten und sonst seinem aufrichtigen Inhalte mit Niemanden zu besprechen: 314

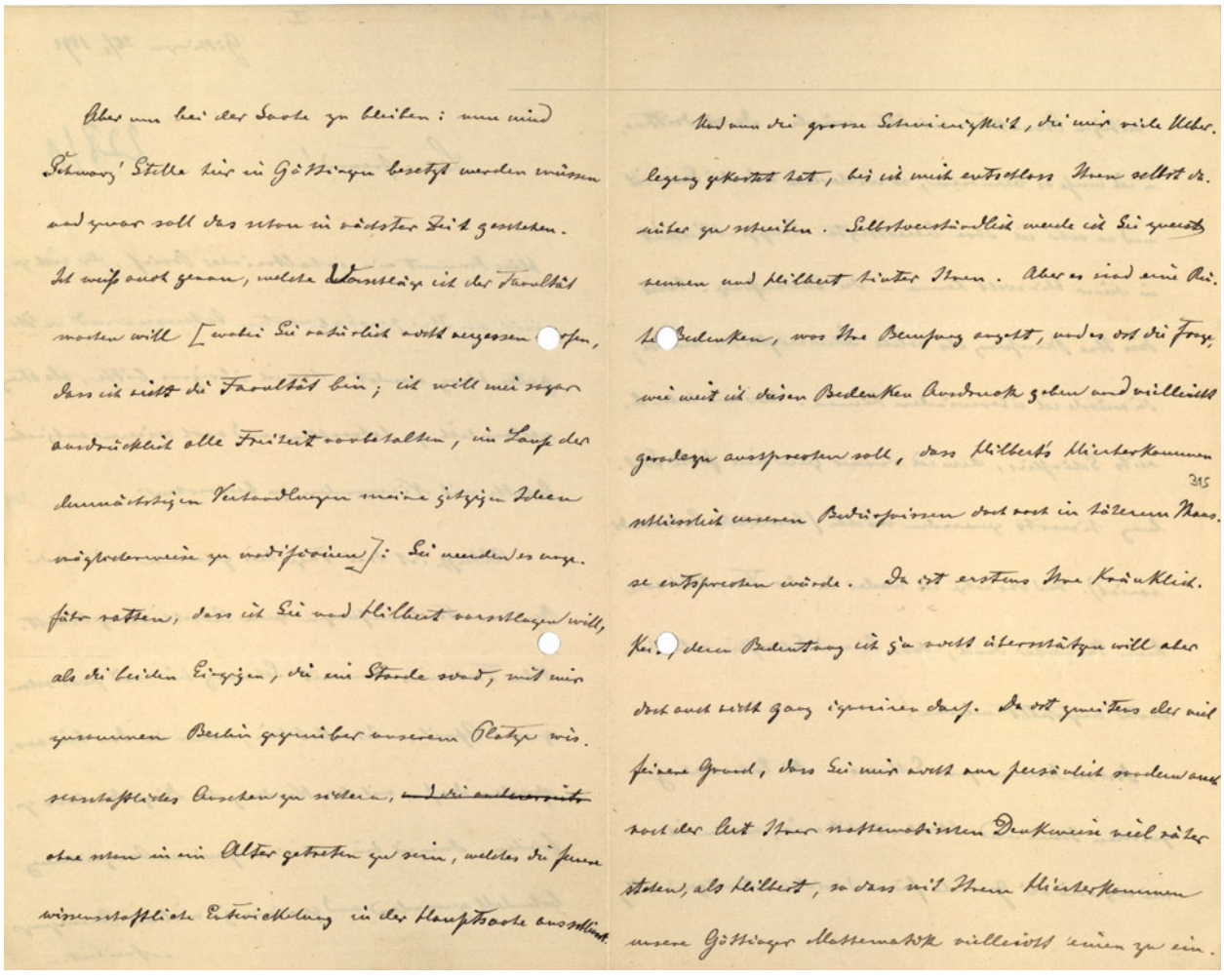
Althoff ist drei Tage hier gewesen und hat die Berliner Neuberufungen zum Abschlusse gebracht. Neben Frobenius kommt Schwarz hin, und zwar schon zum 1. April. – Ich selbst bin, wenn ich das hier aussprechen darf, mit der Wendung der Dinge durchaus zufrieden. Denn ich bin mit einer gewissen Aengstlichkeit behandelt geworden und gewinne so viel an Bewegungsfreiheit. –

seitigen Charakter erhalten würde. Da ist drittens, – ich muß es bedauern, so widerlich mir die Sache ist und so sehr ich Ihre berechtigte Empfindlichkeit in dieser Hinsicht kenne – die Judenfrage. Weiß Ihre Berufung als solche Schwierigkeiten machte; da würde ich überwinden können. Aber wir haben einerseits Schönflies, dem ich immer gern eine feste Stellung hierorts gewünscht möchte (bevölkertes Ostbrandenburg), und das setzt sich wieder in der Facultät noch beim Ministerium durch, daß Sie und Schönflies nebeneinander angestellt werden!

Und so komme zum Schlusse. Die Entscheidung zwischen Ihnen und Hilbert ist mir, wenn ich mir objektiv die Gründe für und wider abwägen soll,

1 (Schmitz 2006).

2 A more detailed discussion of the events described in the following paragraphs can be found in (Rowe 2007).



Göttingen 28 February 1892

Dear friend,

Here comes quite a substantial letter, addressing not only your personal interests but also your good heart, and I ask you to maintain strict confidentiality, and to refrain from discussing its subjective content with anybody.

Althoff was here for three days, and brought the matter of the new appointments for Berlin to a close. In addition to Frobenius, Schwarz will go there, as early as 1 April. As for myself, if I can be frank, I am quite satisfied with the development, as I was treated with a certain distinction, and I will gain much freedom of movement.

But, to keep to the matter at hand: Schwarz's position here in Göttingen will need to be filled now, and this should happen in the near future. I know exactly which suggestions I intend to present the department with (keep in mind, however, that I am not the department; I even intend to claim explicitly the freedom to modify my present ideas in the course of the upcoming negotiations): you will probably have guessed that I want to recommend you and Hilbert as the only two who, together with me, are in a position to

assure Göttingen a place of scientific distinction. [...] And now the great difficulty, which has cost me a lot of deliberation, until I decided to write to you myself about this issue. Naturally I will name you first and Hilbert behind you. There are, however, a series of reservations in connection with your being called, and the question remains, to what extent I should submit to these reservations and [whether I should] perhaps even say right away that Hilbert's coming here would be more suited to our needs in the end. First of all, there is the problem of your health, the relevance of which I do not want to exaggerate, but cannot ignore altogether. Secondly, there is the much subtler difficulty that you are, not only personally but also in your mathematical way of thinking, much closer to me than is Hilbert. Your coming here could therefore perhaps give our Göttingen mathematics a too one-sided character. There is thirdly – I must touch on it, as repugnant as the matter is to me, and knowing full well your justified sensitivity to this – the Jewish question. Not that your call as such would present difficulties; these I would be able to overcome. The problem is that we already have [Arthur] Schönflies for whom I would like to create a firm position as salaried Extraordinarius here. And having you and Schönflies appointed together is something I will not get past either the faculty or the Minister! [...]

Felix Klein met with Friedrich Althoff, an undersecretary at the Ministry of Culture, to get advice about the impending appointment. We can therefore surmise that he was well-informed about the ministry's position. From his letter to Hurwitz, moreover, it is clear that he actually preferred Hilbert's appointment, but that out of a sense of loyalty he also wanted to give Hurwitz a chance. Whatever the case may have been, Klein got neither Hilbert nor Hurwitz: instead, the Göttingen faculty placed Heinrich Weber at the head of the list, and Althoff followed this suggestion.

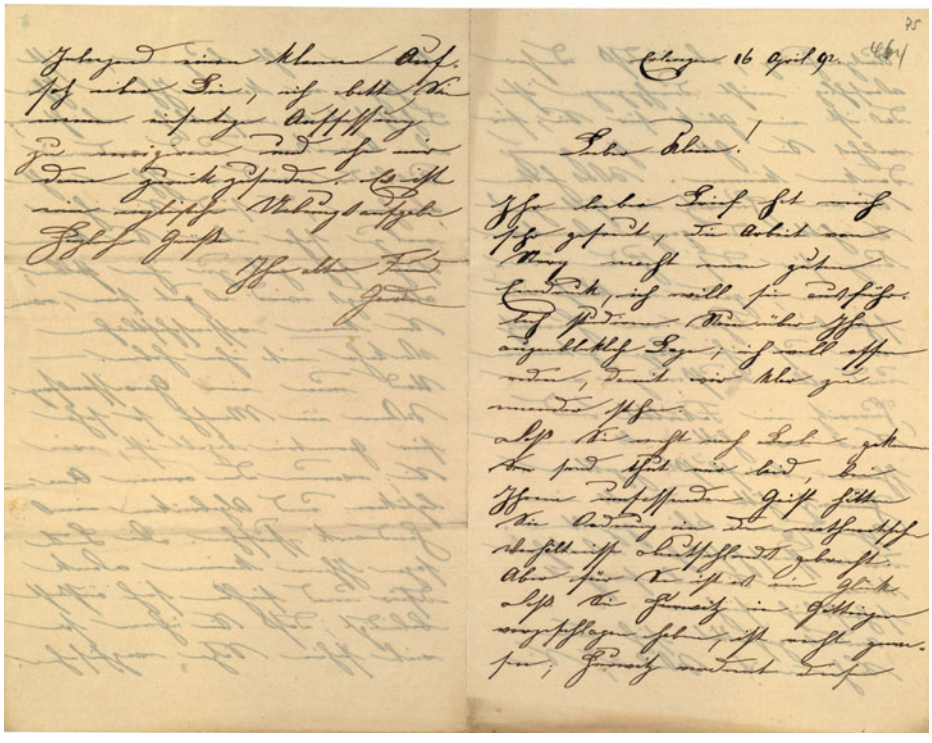
Klein was stunned and irritated at this turn of events. On 7 April 1892, he wrote to Hurwitz: "It must have been, then, that in the end an anti-Semitic vote in the ministry led to the rejection." Though Weber's position in Marburg was now vacant, Klein felt compelled to write to Hurwitz on 11 April 1892 that he viewed his "chances of succeeding Weber in Marburg or obtaining a call anywhere else in Prussia as unfavorable."[3]

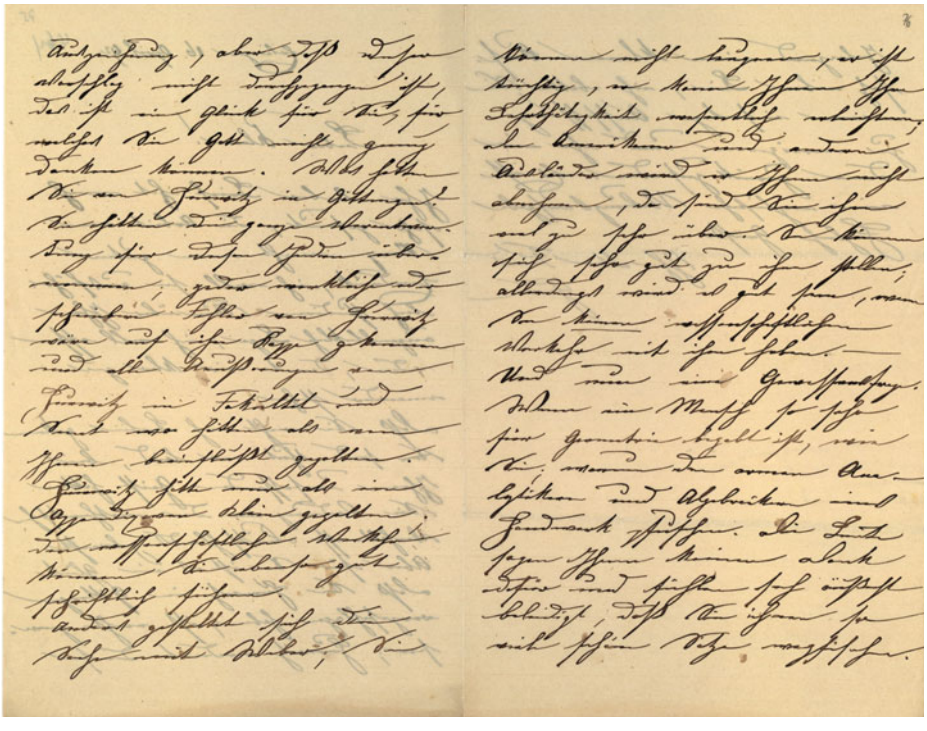
Paul Gordan, an algebraist from Erlangen and Jewish himself, viewed this setback differently than his friend Felix Klein: "I am sorry to hear that you were not appointed to Berlin, as your all-encompassing mind would have brought order to mathematical life in Germany. But it was luck for you. It was right that you recommended Hurwitz for Göttingen; Hurwitz deserves this distinction. But that your recommendation did not go through is your luck, for which you cannot thank God enough. What good would Hurwitz have done you in Göttingen? You would have taken on the complete responsibility for this Jew; every real or apparent mistake by Hurwitz would have fallen on your head, and all his utterances in the faculty and senate would have been regarded as influenced by you. Hurwitz would have been considered nothing more than an appendage of Klein."[4]

3 Quoted from (Rowe 1986: 434).
4 Letter from Paul Gordon to Felix Klein, 16 April 1892.

In his memoirs, on the other hand, the physicist Max Born described Hurwitz as follows: “Hurwitz was a tiny man with the emaciated face of an ascetic in which burned two unnaturally large eyes. He was ailing and very frail. But his lectures were brilliant, perhaps the most perfect I have ever heard. The course was the continuation of another, on analytic functions, which I had not attended; I therefore had some difficulty in following and had to work hard, reading many books. Once when I had missed a point in a lecture I went to Hurwitz afterwards and asked for a private explanation. He invited me and another student from Breslau [...] to his house and

Paul Gordan's letter to Felix Klein, 16 April 1892





gave us a series of private lectures on some chapters of the theory of functions of complex variables, in particular on Mittag-Loeffler's theorem, which I still consider as one of the most impressive experiences of my student life. I carefully worked out the whole course, including these private appendices, and my notebook was used by Courant, when he, many years later and after Hurwitz' death, published his well-known book on analytical functions, the so-called Courant-Hurwitz."[5]

On Klein's initiative, an Extraordinariat for applied mathematics was established for Arthur Schoenflies (1853-1928) in 1892. In 1901, Karl Schwarzschild (1873-1916) became director of the Göttingen observatory. Klein worked closely together with him on questions of applied mathematics. When Heinrich Weber was appointed in Strasbourg, Felix Klein was once again able to take action on behalf of David Hilbert. This time he was successful, and Hilbert assumed the position of professor at Göttingen.

David Hilbert, Felix Klein, Karl Schwarzschild

5 (Born 1978: 72).

Hilbert's doctoral students

Göttingen's heyday as an international center for mathematics began with David Hilbert's appointment in 1895 as Heinrich Weber's successor. More than a few of Hilbert's 73 doctoral students were Jewish, among them Otto Blumenthal, Max Dehn, Felix Bernstein, Ernst Hellinger, Alfréd Haar, Richard Courant, Hugo Steinhaus, and Jacob Grommer.

The oral and formal culture of mathematics

In 1902, Hermann Minkowski (1864-1909) left Zurich for an appointment at Göttingen. Like Hilbert, Minkowski too was an outstanding mathematician who covered the entire span of the discipline, from number theory to mathematical physics. The two were bound by a close friendship dating back to their student days in Königsberg. Together with their somewhat older mutual friend Adolf Hurwitz, they developed an intensive culture of open discussions on mathematical issues that were of interest at the time. In addition to the written and formal axiomatic approach, this oral culture became a distinguishing feature of Göttingen mathematics in the first third of the 20th century. Minkowski's contributions to number theory and to space-time in the special theory of relativity left a lasting mark on Göttingen mathematics.

Hermann Minkowski

Even before Minkowski's appointment at Göttingen, an intensive written exchange had been taking place between Hilbert and his mathematician friends from their student years together. Thus, for example, Minkowski and Hurwitz had read the proofs for Hilbert's *Zahlbericht* and gave him advice prior to his lecture at the Second International Congress of Mathematicians in Paris. Minkowski was even the one who suggested taking this opportunity to lecture on "mathematical problems". Not only that, he also gave his friend tips on the individual problems which would later go down in history as Hilbert's "Mathematical Problems". In a letter dated 10 July 1900, Minkowski draws Hilbert's attention to certain questions raised by Ludwig Boltzmann that Hilbert took up for the 6th Paris Problem (mathematical treatment of the axioms of physics).[6] Hurwitz too offered some tips for the 22nd problem (the uniformization of analytic relations by means of automorphic functions).

Writing to Hilbert on the second problem (the consistency of the axioms of arithmetic), Minkowski said: "It is highly original, in any case, to identify something which mathematicians for the longest time believed they knew completely, like the arithmetical axioms, as a problem for the future. What are the people in the auditorium, especially the numerous non-mathematicians in attendance, going to say about this? Will their respect for us increase? You will also have some hard battles to fight with the philosophers."[7]

When Minkowski received the final proofs of Hilbert's speech to the Paris congress in the post, he expressed his enthusiasm for the text: "Dear friend, I can only wish you luck on your speech; it will certainly be the event of the congress and its success will be lasting. For I believe that this speech, which probably every mathematician without exception will read, will cause your powers of attraction on young mathematicians to grow still more, if that is even possible [...] Now you have really wrapped up the mathematics for the twentieth century and in most quarters you will gladly be acknowledged as its general director."[8]

6 Minkowski to Hilbert, 16 July 1900, SUB Göttingen, Handschriftenabteilung, Cod. Ms. D. Hilbert, 258.
7 Minkowski to Hilbert, 17 July 1900, ibid. p. 64
8 Minkowski to Hilbert, 28 July 1900, quoted in (Gray 2001: 59).

In 1909, after Minkowski's untimely death of appendicitis, his place was filled by Edmund Landau (1877-1938), who had come to Göttingen from the 'Berlin school' of mathematics. Landau was an outstanding exponent of a strictly formally structured style within the field of pure mathematics, especially in analysis. In contrast to his predecessor, he distanced himself from the application of mathematical knowledge, even in theoretical physics. Landau's formal style in analysis and number theory went well with Hilbert's change of direction after 1920 towards a strictly formal foundational program within the fundamentals of mathematics. Nevertheless, toward the end of the Weimar Republic, it was Landau alone, and not Hilbert, who became the target of a racist segment of Göttingen students in their rejection of formalism in mathematics. Following an infamous boycott of the "Landau style" in basic mathematics instruction by Nazi students in autumn 1933, Landau retired.

Edmund Landau

Albert Einstein and Jacob Grommer

David Hilbert fought numerous battles in the faculty to make it possible for foreigners to be admitted to doctoral studies. Jacob Grommer (1879-1933), a Russian Orthodox Jew who had dedicated his youth in Brest-Litovsk to Talmudic study, presented a particularly difficult case. In 1906, he began studying mathematics in Bern University. He later continued with mathematics, physics and philosophy at Marburg and, as of 1907, at Göttingen. Since Grommer did not have a diploma from a nine-class German school, it was a challenge even for Hilbert to facilitate his admission to the doctoral exam. The reference letter he provided was decisive for his acceptance. In it, Hilbert wrote that Grommer's work was "at the level of a habilitation dissertation" and that "from now on" its central formula would "have a place in every textbook on function theory."

In summer 1915, on the occasion of one of the Wolfskehl lectures held at the Göttingen mathematical institute, Albert Einstein (1879-1955) spoke on the status of his theory of gravitation. This lecture provided the opportunity for a warm exchange with Hilbert and other Göttingen mathematicians.

Though no evidence can be found in primary sources, it is likely that Einstein met Grommer during this visit to Göttingen. It is well-known that he took him on as an assistant in 1916. We will probably never know with any certainty what assistance Grommer provided Einstein, but we can form a preliminary picture based on existing archival material. Occasional remarks in Einstein's publications indicate Grommer's role in his work. For example, in his famous 1917 essay on "Cosmological Considerations in the General Theory of Relativity", Einstein writes: "With the kind assistance of mathematician J. Grommer, I now investigated centrally symmetrical, static gravitational fields that degenerate at infinity in the way mentioned."[9]

Jacob Grommer worked with Einstein for more than ten years, longer than any of his other assistants. At the end of the 1920s he took a position in Minsk, where he died in 1933.

9 (Einstein 1996: 425).

Gutachten betreffend Bewerbung des studiosus Jacob Grommer um Zulassung zum Doktorexamen.

Die Arbeit hat sich aus einem von Hurwitz (in Zürich) gestellten Problem entwickelt, die Bedingungen für die Realität der sämtlichen Nullstellen einer ganzen rationalen Funktion auf ganze transcendente Funktionen zu übertragen. Das Hauptresultat der Arbeit ist, daß nicht nur die entsprechenden Bedingungen bei einer ganzen transcendenten Funktion vom Geschlecht 0 oder notwendig und hinreichend sind für die Realität ihrer Nullstellen, sondern daß — und dies geht über die ursprüngliche Fragestellung von Hurwitz wesentlich hinaus — das Erfülltsein der betreffenden Bedingungen von selbst schon ein charakteristisches Kennzeichen für die Endlichkeit des Geschlechts abgiebt. Genauer lautet das Ergebnis so: ist $f(z) = 1 + c_1 z + c_2 z^2 + \cdots$ eine ganze transcendente Funktion, ist ferner $s_1 + s_2 z + s_3 z^2 + \cdots$ die Entwicklung von $-\frac{f'(z)}{f(z)}$ um den Nullpunkt, und ist

$$H_n = \begin{vmatrix} s_2 & s_3 & s_4 & \cdots & s_{n+1} \\ s_3 & s_4 & s_5 & \cdots & s_{n+2} \\ s_4 & s_5 & s_6 & \cdots & s_{n+3} \\ \cdots & \cdots & \cdots & \cdots & \cdots \\ s_{n+1} & s_{n+2} & s_{n+3} & \cdots & s_{2n} \end{vmatrix},$$

so ist die Positivität aller H_n notwendig und

From Hilbert's letter of reference concerning the student Jacob Grommer's application for admission to the doctoral examination, 1913

for the components of momentum, and for the energy (in the static case)

$$m\sqrt{B}.$$

From the expressions for the momentum, it follows that $m\frac{A}{\sqrt{B}}$ plays the part of the rest mass. As m is a constant peculiar to the point of mass, independently of its position, this expression, if we retain the condition $\sqrt{g} - = 1$ at spatial infinity, can vanish only when A diminishes to zero, while B increases to infinity. It seems, therefore, that such a degeneration of the co-efficients $g_{\mu\nu}$ is required by the postulate of relativity of all inertia. This requirement implies that the potential energy $m\sqrt{B}$ becomes infinitely great at infinity. Thus a point of mass can never leave the system; and a more detailed investigation shows that the same thing applies to light-rays. A system of the universe with such behaviour of the gravitational potentials at infinity would not therefore run the risk of wasting away which was mooted just now in connexion with the Newtonian theory.

I wish to point out that the simplifying assumptions as to the gravitational potentials on which this reasoning is based, have been introduced merely for the sake of lucidity. It is possible to find general formulations for the behaviour of the $g_{\mu\nu}$ at infinity which express the essentials of the question without further restrictive assumptions.

At this stage, with the kind assistance of the mathematician J. Grommer, I investigated centrally symmetrical, static gravitational fields, degenerating at infinity in the way mentioned. The gravitational potentials $g_{\mu\nu}$ were applied, and from them the energy-tensor $T_{\mu\nu}$ of matter was calculated on the basis of the field equations of gravitation. But here it proved that for the system of the fixed stars no boundary conditions of the kind can come into question at all, as was also rightly emphasized by the astronomer de Sitter recently. [7] [8]

For the contravariant energy-tensor $T^{\mu\nu}$ of ponderable matter is given by

$$T^{\mu\nu} = \rho\frac{dx_\mu}{ds}\frac{dx_\nu}{ds},$$

where ρ is the density of matter in natural measure. With

Excerpt from Einstein's "Cosmological Considerations in the General Theory of Relativity", 1917

Emmy Noether

Emmy Noether

Emmy Noether, the daughter of Erlangen professor Max Noether, became known as an algebraist primarily through her essays on invariant theory, ideal theory and non-commutative algebra. However, she also made contributions to mathematical physics as well as to topology and number theory. Emmy Noether arrived at Göttingen only a short time before Einstein held his lectures there. As an expert in invariant theory, she assisted Hilbert, who had set himself the task of combining Einstein's and Mie's field theories. At the same time, Felix Klein wanted to explain certain basic, formal problems in the theory of relativity which Hilbert had left unsolved. This led to Noether's fundamental contribution to the theory of relativity. Klein gave her the task of examining the difference between conservation laws in the general theory of relativity and classical physics (including the special theory of relativity). The impetus for this project came from Hilbert.

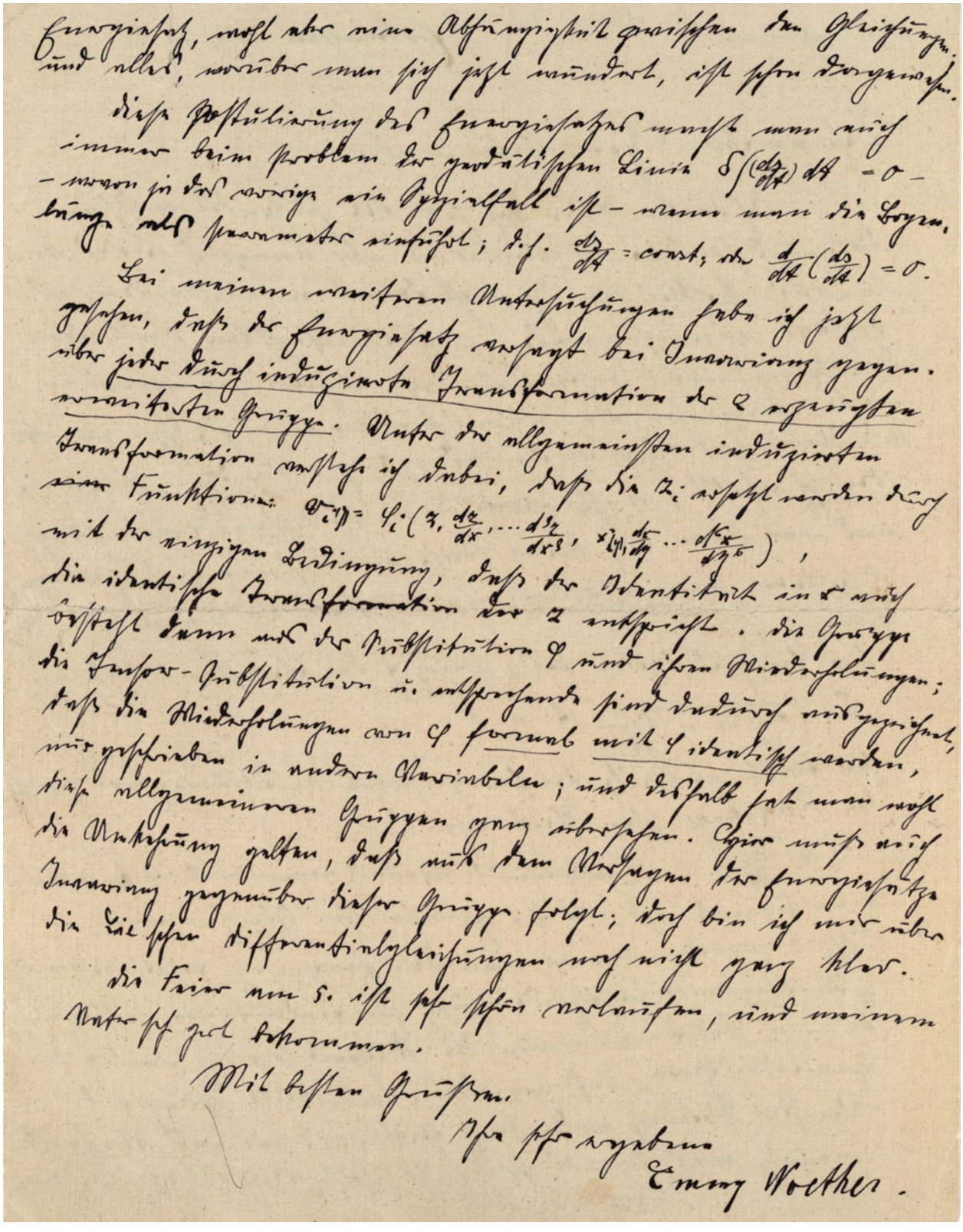
As early as 12 March 1918, Noether shared her idea for evidence of the main result with Klein: "As a result of my further research, I have now seen that the energy law is not valid in the case of invariance under every extended group generated by the transformation induced by the z."[10]

Noether elaborated her results in her "Invariant Variational Problems", a text which has often been quoted since then and which Klein presented to the Göttingen Academy. Soon after this, it was published in *Göttinger Nachrichten*, a local newspaper.

Today, Noether's equations have become a fundamental part of mathematical physics. Accordingly, Deutsche Forschungsgemeinschaft introduces its Emmy Noether program with a reference to the Noether theorems, which "describe the conservation laws for energy, momentum and angular momentum" that "are among the basic elements of mathematical physics". For Noether herself, however, this was no more than merely fortuitous contract work, and she did not view the results as particularly profound. She did not continue working on the topic of "invariant variational problems" in her later career. It was not until decades after her death that physicists stumbled upon these early achievements of Emmy Noether, so that her name was finally linked to the conservation laws in the 1960s.[11]

Naturally, Noether's achievements did not remain unknown to Einstein. He also knew from Hilbert that her earlier application for habilitation had caused a fierce debate within the Göttingen philosophical faculty. On 24 May 1918 he wrote to Hilbert: "Yesterday, I received a very interesting paper from Miss Noether on the formation of invariants. It astounds me that these things can be surveyed from such a general viewpoint. It would not have hurt the Göttingen "Feldgrauen" [field grays – soldiers on leave studying at Göttingen during the war years] if they had been sent to Miss Noether's classes. She seems to know her business."[12]

10 Quoted in (Kosmann-Schwarzbach 2010: 157).
11 For a thorough description of the history of reception, see ibid.
12 (Kimberling 1981: 13).



Excerpt of a letter from
Emmy Noether to Felix Klein,
12 March 1918

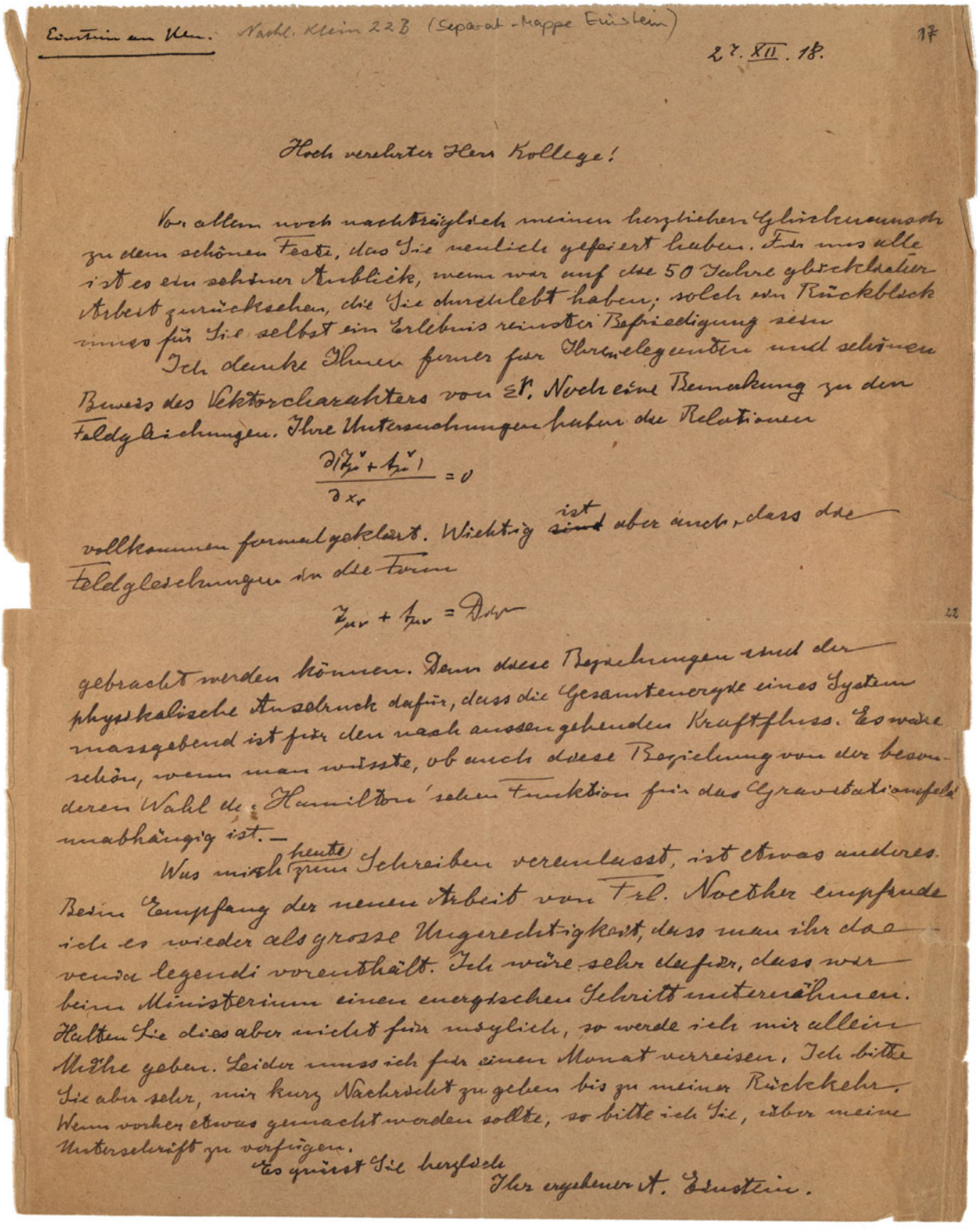
In his obituary to Emmy Noether, Bartel L. van der Waerden wrote of this paper that here for the first time she "showed the general methods which are appropriate for the generation of all differential invariants."[13] This remark referred to her concept of a "reduction system", i.e. a system of differential invariants from which all other invariants can be derived algebraically.

At this time, during the crucial phase of World War I, a renewed attempt at habilitation would have made no sense. Six months later, when the political landscape changed, Einstein judged the situation differently. On 27 December 1918 he made his opinion known to Felix Klein: "When I received Miss Noether's latest paper, I once again felt what a great injustice it is that she should be denied the venia legendi. I would be very much in favor of our taking vigorous steps vis-à-vis the Ministry. However, were you to find this impossible, I should pursue the matter on my own."

Shortly thereafter, Klein sent an official letter to the ministry: "During her time here, Miss Noether has not only fulfilled the hopes we placed on her effectiveness: indeed, she has exceeded them. Several papers published in rapid succession – which we are enclosing – show that she has now doubtlessly joined the ranks of those standing at the forefront of productive mathematics and that she exerts an altogether valuable supporting influence through her teaching and her relationship to the entire circle of colleagues here in Göttingen."[14] Soon thereafter, Noether was declared a member of the academic staff at Göttingen and was accorded the title of Extraordinarius; she would, however, never be accorded a paid professorship in Göttingen. Noether embodied the lively, oral culture of mathematics that characterized the atmosphere at Göttingen in the pre-war years. As a result of her intellectual engagement and the effectiveness of her ideas, she was a magnet for a considerable number of students as well as established mathematicians.

Beginning in the mid 1920s, modern algebraic methods were also being applied to topology. Emmy Noether was one of the first to point out the possibilities this development opened up. Her ideas, presented at a meeting of topologists hosted by L.E.J. Brouwer in Blaricum in December 1925, made a significant contribution to the transition from classical analysis situs to modern algebraic topology, especially thanks to her influence on Pavel Alexandroff and Heinz Hopf. Once the Nazis took power, Emmy Noether, like all other Jewish mathematicians, was expelled from her university. Like Richard Courant and Hermann Weyl, she emigrated to the USA. Her brother Fritz, a mathematician at the University of Breslau, emigrated to the USSR, where he was arrested in 1937 as a result of Stalinist persecutions and shot in 1941. In his obituary to Emmy Noether, Hermann Weyl wrote: "When I was called permanently to Göttingen in 1930, I earnestly tried to obtain from the Ministry a better position for her, because I was ashamed to occupy such a preferred position beside her whom I knew to be my superior as a mathematician in many respects. I did not succeed, nor did an attempt to push through her election as a member of the Göttinger Gesellschaft der Wissenschaften. Tradition, prejudice and external considerations weighted the balance against her scientific merits and scientific greatness, by that time denied by no one."[15]

13 (Waerden 1935).
14 (Tollmien 1990: 185).
15 (Weyl 1935).



Einstein an Kln. Nachl. Klein 22B (Separat-Mappe Einstein)

27. XII. 18.

17

Hoch verehrter Herr Kollege!

Vor allem noch nachträglich meinen herzlichen Glückwunsch zu dem schönen Feste, das Sie neulich gefeiert haben. Für uns alle ist es ein schöner Anblick, wenn wer auf die 50 Jahre gedeihlicher Arbeit zurücksehen, die Sie durchlebt haben; solch ein Rückblick muss für Sie selbst ein Erlebnis reinster Befriedigung sein.

Ich danke Ihnen ferner für Ihre gelegentliche und schöne Bemerkung des Vektorcharakters von Et. Noch eine Bemerkung zu den Feldgleichungen. Ihre Untersuchungen haben die Relationen

$$\frac{\partial (\mathfrak{T}_\nu^\sigma + t_\nu^\sigma)}{\partial x_\sigma} = 0$$

vollkommen formal geklärt. Wichtig ~~sind~~ ist aber auch, dass die Feldgleichungen die Form

$$\mathfrak{T}_{\mu\nu} + t_{\mu\nu} = 0$$

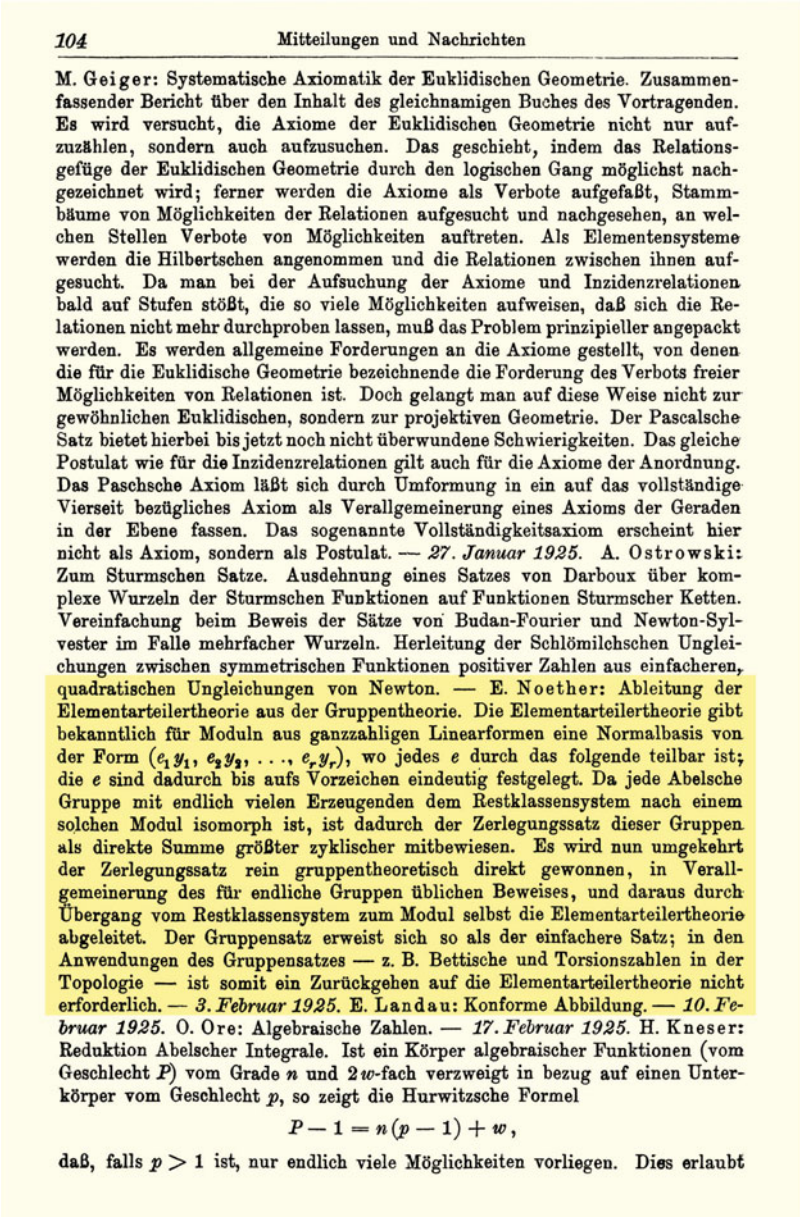
gebracht werden können. Denn diese Beziehungen sind der physikalische Ausdruck dafür, dass die Gesamtenergie eines Systems massgebend ist für den nach aussen gehenden Kraftfluss. Es wäre schön, wenn man wüsste, ob auch diese Beziehung von der besonderen Wahl der Hamilton'schen Funktion für das Gravitationsfeld unabhängig ist. —

Was mich heute zum Schreiben veranlasst, ist etwas anderes. Beim Empfang der neuen Arbeit von Frl. Noether empfinde ich es wieder als grosse Ungerechtigkeit, dass man ihr das venia legendi vorenthält. Ich wäre sehr dafür, dass wir beim Ministerium einen energischen Schritt unternähmen. Halten Sie dies aber nicht für möglich, so werde ich mir allein Mühe geben. Leider muss ich für einen Monat verreisen. Ich bitte Sie aber sehr, mir kurz Nachricht zu geben bis zu meiner Rückkehr. Wenn vorher etwas gemacht werden sollte, so bitte ich Sie, über meine Unterschrift zu verfügen.

Es grüsst Sie herzlich

Ihr ergebener A. Einstein.

Excerpt of a letter from Albert Einstein to Felix Klein, 27 December 1918



104 Mitteilungen und Nachrichten

M. Geiger: Systematische Axiomatik der Euklidischen Geometrie. Zusammenfassender Bericht über den Inhalt des gleichnamigen Buches des Vortragenden. Es wird versucht, die Axiome der Euklidischen Geometrie nicht nur aufzuzählen, sondern auch aufzusuchen. Das geschieht, indem das Relationsgefüge der Euklidischen Geometrie durch den logischen Gang möglichst nachgezeichnet wird; ferner werden die Axiome als Verbote aufgefaßt, Stammbäume von Möglichkeiten der Relationen aufgesucht und nachgesehen, an welchen Stellen Verbote von Möglichkeiten auftreten. Als Elementensysteme werden die Hilbertschen angenommen und die Relationen zwischen ihnen aufgesucht. Da man bei der Aufsuchung der Axiome und Inzidenzrelationen bald auf Stufen stößt, die so viele Möglichkeiten aufweisen, daß sich die Relationen nicht mehr durchproben lassen, muß das Problem prinzipieller angepackt werden. Es werden allgemeine Forderungen an die Axiome gestellt, von denen die für die Euklidische Geometrie bezeichnende die Forderung des Verbots freier Möglichkeiten von Relationen ist. Doch gelangt man auf diese Weise nicht zur gewöhnlichen Euklidischen, sondern zur projektiven Geometrie. Der Pascalsche Satz bietet hierbei bis jetzt noch nicht überwundene Schwierigkeiten. Das gleiche Postulat wie für die Inzidenzrelationen gilt auch für die Axiome der Anordnung. Das Paschsche Axiom läßt sich durch Umformung in ein auf das vollständige Vierseit bezügliches Axiom als Verallgemeinerung eines Axioms der Geraden in der Ebene fassen. Das sogenannte Vollständigkeitsaxiom erscheint hier nicht als Axiom, sondern als Postulat. — *27. Januar 1925.* A. Ostrowski: Zum Sturmschen Satze. Ausdehnung eines Satzes von Darboux über komplexe Wurzeln der Sturmschen Funktionen auf Funktionen Sturmscher Ketten. Vereinfachung beim Beweis der Sätze von Budan-Fourier und Newton-Sylvester im Falle mehrfacher Wurzeln. Herleitung der Schlömilchschen Ungleichungen zwischen symmetrischen Funktionen positiver Zahlen aus einfacheren, quadratischen Ungleichungen von Newton. — E. Noether: Ableitung der Elementarteilertheorie aus der Gruppentheorie. Die Elementarteilertheorie gibt bekanntlich für Moduln aus ganzzahligen Linearformen eine Normalbasis von der Form $(e_1 y_1, e_2 y_2, \ldots, e_r y_r)$, wo jedes e durch das folgende teilbar ist; die e sind dadurch bis aufs Vorzeichen eindeutig festgelegt. Da jede Abelsche Gruppe mit endlich vielen Erzeugenden dem Restklassensystem nach einem solchen Modul isomorph ist, ist dadurch der Zerlegungssatz dieser Gruppen als direkte Summe größter zyklischer mitbewiesen. Es wird nun umgekehrt der Zerlegungssatz rein gruppentheoretisch direkt gewonnen, in Verallgemeinerung des für endliche Gruppen üblichen Beweises, und daraus durch Übergang vom Restklassensystem zum Modul selbst die Elementarteilertheorie abgeleitet. Der Gruppensatz erweist sich so als der einfachere Satz; in den Anwendungen des Gruppensatzes — z. B. Bettische und Torsionszahlen in der Topologie — ist somit ein Zurückgehen auf die Elementarteilertheorie nicht erforderlich. — *3. Februar 1925.* E. Landau: Konforme Abbildung. — *10. Februar 1925.* O. Ore: Algebraische Zahlen. — *17. Februar 1925.* H. Kneser: Reduktion Abelscher Integrale. Ist ein Körper algebraischer Funktionen (vom Geschlecht P) vom Grade n und $2w$-fach verzweigt in bezug auf einen Unterkörper vom Geschlecht p, so zeigt die Hurwitzsche Formel

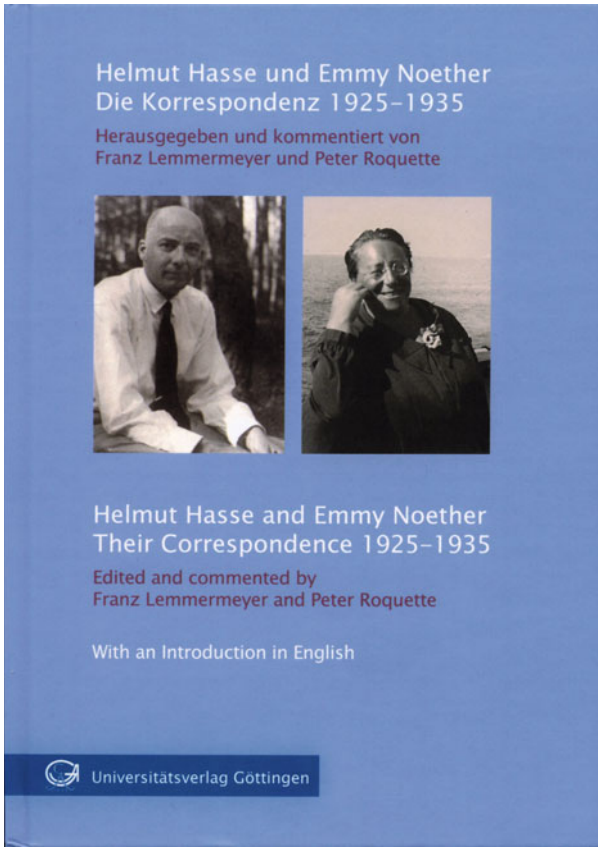
$$P - 1 = n(p - 1) + w,$$

daß, falls $p > 1$ ist, nur endlich viele Möglichkeiten vorliegen. Dies erlaubt

Report on one of Emmy Noether's lectures in Göttingen, which played a decisive role in the development of modern algebraic topology, *Jahresbericht der DMV* 34 (1925), p. 104

E. Noether: Derivation of the theory of elementary divisors from group theory. As is well known, for modules of integer-valued linear forms the theory of elementary divisors provides a normal basis of the form $(e_1y_1, e_2y_2, \ldots, e_ry_r)$, where every e is divisible by the following; the e are determined uniquely up to their sign. Since every Abelian group with finitely many generators is isomorphic with the coset system of such a module the theorem about the decomposition of such groups into a direct sum of largest cyclic groups is proved at the same time. Now, conversely, the decomposition theorem is obtained by purely group-theoretic means, generalizing the usual proof for finite groups, and by passing from the coset system to the module the theory of elementary divisors is obtained. Therefore the theorem about groups is shown to be the simpler theorem; in its applications – e.g. on Betti and torsion numbers in topology – it is no longer necessary to invoke the theory of elementary divisors.

Emmy Noether and friends in Nikolausberg, near Göttingen, 1932. From left to right: Ernst Witt, Paul Bernays, Helene Weyl, Hermann Weyl, Joachim Weyl, Emil Artin, Emmy Noether, Ernst Knauf, unknown, Chiungtze Tsen, Erna Bannow (later Mrs. E. Witt)



Correspondence between Emmy Noether and Helmut Hasse, ed. by Franz Lemmermeyer and Peter Roquette, Göttingen 2006

During the Weimar Republic

Otto Blumenthal

Paul Bernays

The heyday of Göttingen mathematics that had begun in the late 19th and early 20th century continued after the retirement of Felix Klein in 1913, during the collapse of the Wilhelmine Empire, and throughout the Weimar Republic. Mathematics at Göttingen continued to be shaped by David Hilbert and a number of productive mathematicians of the next generation, many of whom were Jewish. Among them was also one outstanding female scientist. This glorious and productive period came to an abrupt end with their exclusion and expulsion after 1933.

Hilbert knew how to convince young mathematicians to collaborate with him on his projects. Frequently, however, rather than sharing the limelight, they tended to be obscured by the greatness of Hilbert's reputation. Otto Blumenthal (1876-1944) helped organize academic activities at Göttingen without stepping into the foreground. Following his appointment in Aachen in 1906, he remained managing editor of *Mathematische Annalen*. In an address in honor of Otto Blumenthal on 30 September 1905, Hilbert said:

> Ladies and Gentlemen,
>
> When I think of our friend B[lumenthal], his entire being, his activity, his mind, nothing seems more appropriate to me than being able to identify the most characteristic feature of his personality as the drive to work, the genuine joy in working and creative energy. It reveals itself in small things and large; we noticed it at an early stage, when as a student he tried to obtain the most comprehensive education in the many fields of math[ematics], phys[ics and] chemistry. And now that he has become our colleague, we see his zeal in preparing for lectures, his willingness to take over a course which has to be held but which absolutely nobody feels like doing; the effort that he puts into helping his students, how almost alone he bears the burden of one of his many seminars, how he organizes student lectures and takes over intractable doctoral candidates of whom we despair [...]

Excerpt from Hilbert's speech for Blumenthal on 30 September 1905

Paul Bernays (1888-1977) was a vital mainstay in the development of Hilbert's program on the foundations of mathematics. The Hilbert-Bernays collaboration was rooted in the nearly symbiotic relationship between the two scientists. While Hilbert set the course and raised the important questions, Bernays worked out solutions and provided the technical argumentation.

Hilbert 572.

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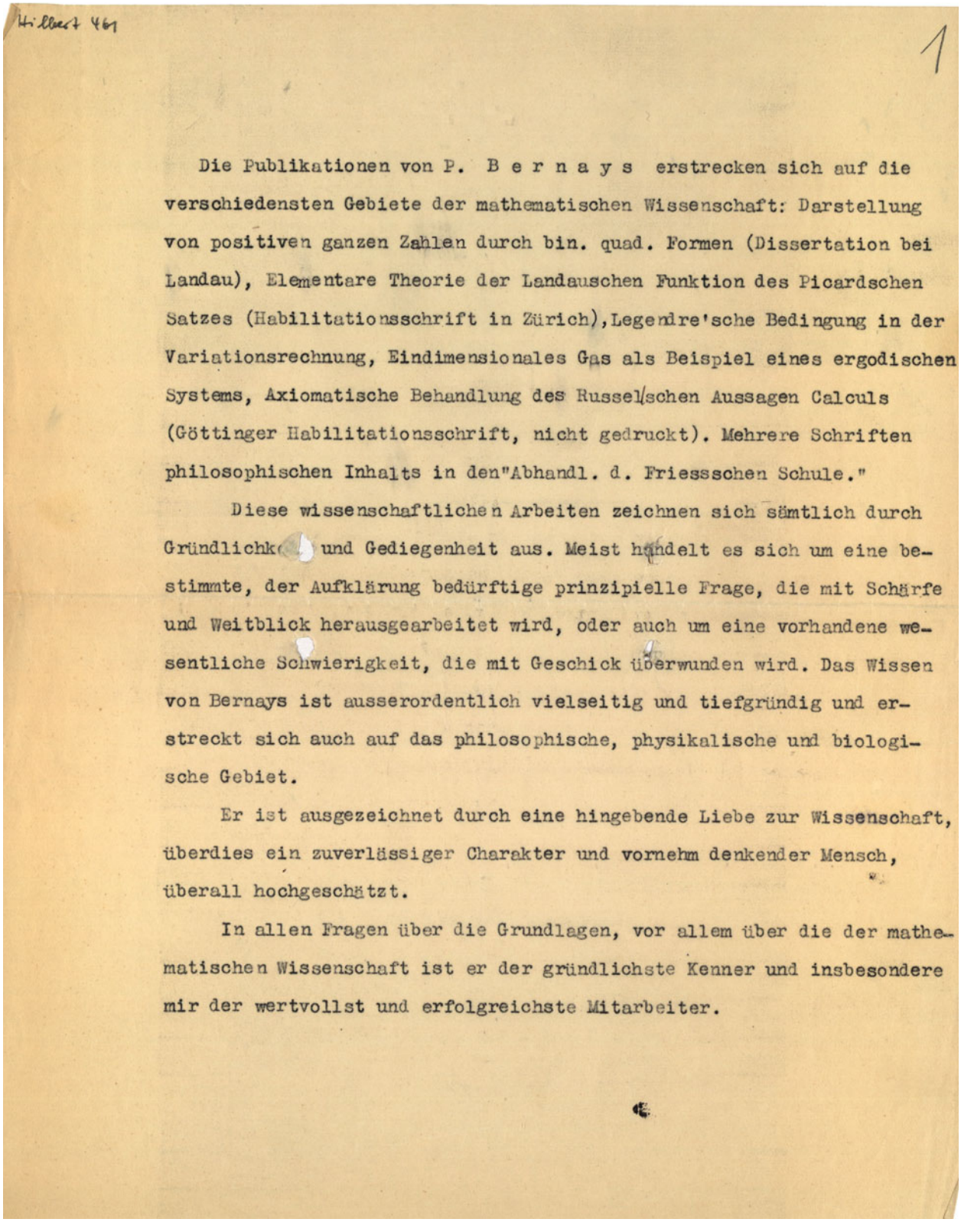
Für Blumenthal (Rede am 30 Sept. 1905)

Ab. Damen u. Herrn. Wenn ich mir unseren Freund B., sein ganzes Wesen, Thun und Sinnen vorstelle, so erscheint mir nichts treffender, als der eigenste Grundzug seiner Persönlichkeit ~~als~~ hingestellt werden zu können als die Lust an der Arbeit, die echte reichte Arbeits- ~~freude~~ freudigkeit und Schaffenskraft. Sie betätigt sich im Kleinen, wie im Grossen; wir bemerken sie schon von früh an, als er als Student eine möglichst vielseitige Ausbildung in den zahlreichen Gegenständen der Math. Phys. Chemie erstrebt. Und als er unser Kollege wird, da sehen wir seinen Eifer bei der Vorbereitung der Vorlesungen, die ~~er~~ er mit den Studenten gibt. Bereitwilligkeit, mit der er eine Vorlesung übernimmt, die gelesen werden muss aber auf die gerade Niemand Lust hat; die Absicht, die er mit den Studenten gibt, wie er die Last einer von vielen abgehaltenen Seminare fast allein trägt, wie er die Vorträge der Studenten berichtet, instruktable Doktoranden, an denen wir verzweifeln, selber übernimmt. Als ihm die Regierung ein Kommissorium nach Marburg anbietet, übernimmt er es sofort, obwohl er lieber hier geblieben wäre und ein anderer Privatdozent dasselbe pure abgelehnt hatte. Als wir ihm die Mitredaktion in den Annalen anbieten, übernimmt er mit weitestem Umfange die unbequemen Pflichten und trifft die Hauptarbeit. Aber jener Grundzug seines Wesens bestimmt auch in seiner wissenschaftlichen Tätigkeit die Richtung und die wissenschaftlichen Ziele, in deren Dienst er seine reichen Anlagen und sein glänzendes mathematisches Talent stellt. Sucht er doch stets solche Probleme auf, deren Lösung die energischste tiefgehende Arbeit verlangt, vor denen ein Anderer zurückschreckt, weil nicht leichter mühelose Gewinn winkt; er führt sie durch, sobald er nur erst auch hat, dass diese Arbeit einmal geleistet werden muss. So hat er die Eliminationsth. wie keine gebracht, wo bedeutende Vorgänger nicht durchgekommen sind. So hat er die Weierstrassschen Sätze über ~~zu~~ mehrfach periodische Funktionen auf die viel komplizierteren Verhältnisse der Th. der automorphen Funktionen mehrerer Veränderlicher übertragen. Wo ihnen dabei



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Die Publikationen von P. B e r n a y s erstrecken sich auf die verschiedensten Gebiete der mathematischen Wissenschaft: Darstellung von positiven ganzen Zahlen durch bin. quad. Formen (Dissertation bei Landau), Elementare Theorie der Landauschen Funktion des Picardschen Satzes (Habilitationsschrift in Zürich), Legendre'sche Bedingung in der Variationsrechnung, Eindimensionales Gas als Beispiel eines ergodischen Systems, Axiomatische Behandlung des Russel/schen Aussagen Calculs (Göttinger Habilitationsschrift, nicht gedruckt). Mehrere Schriften philosophischen Inhalts in den"Abhandl. d. Friessschen Schule."

Diese wissenschaftlichen Arbeiten zeichnen sich sämtlich durch Gründlichk[illegible] und Gediegenheit aus. Meist handelt es sich um eine bestimmte, der Aufklärung bedürftige prinzipielle Frage, die mit Schärfe und Weitblick herausgearbeitet wird, oder auch um eine vorhandene wesentliche Schwierigkeit, die mit Geschick überwunden wird. Das Wissen von Bernays ist ausserordentlich vielseitig und tiefgründig und erstreckt sich auch auf das philosophische, physikalische und biologische Gebiet.

Er ist ausgezeichnet durch eine hingebende Liebe zur Wissenschaft, überdies ein zuverlässiger Charakter und vornehm denkender Mensch, überall hochgeschätzt.

In allen Fragen über die Grundlagen, vor allem über die der mathematischen Wissenschaft ist er der gründlichste Kenner und insbesondere mir der wertvollst und erfolgreichste Mitarbeiter.

Hilbert's letter of reference for Bernays

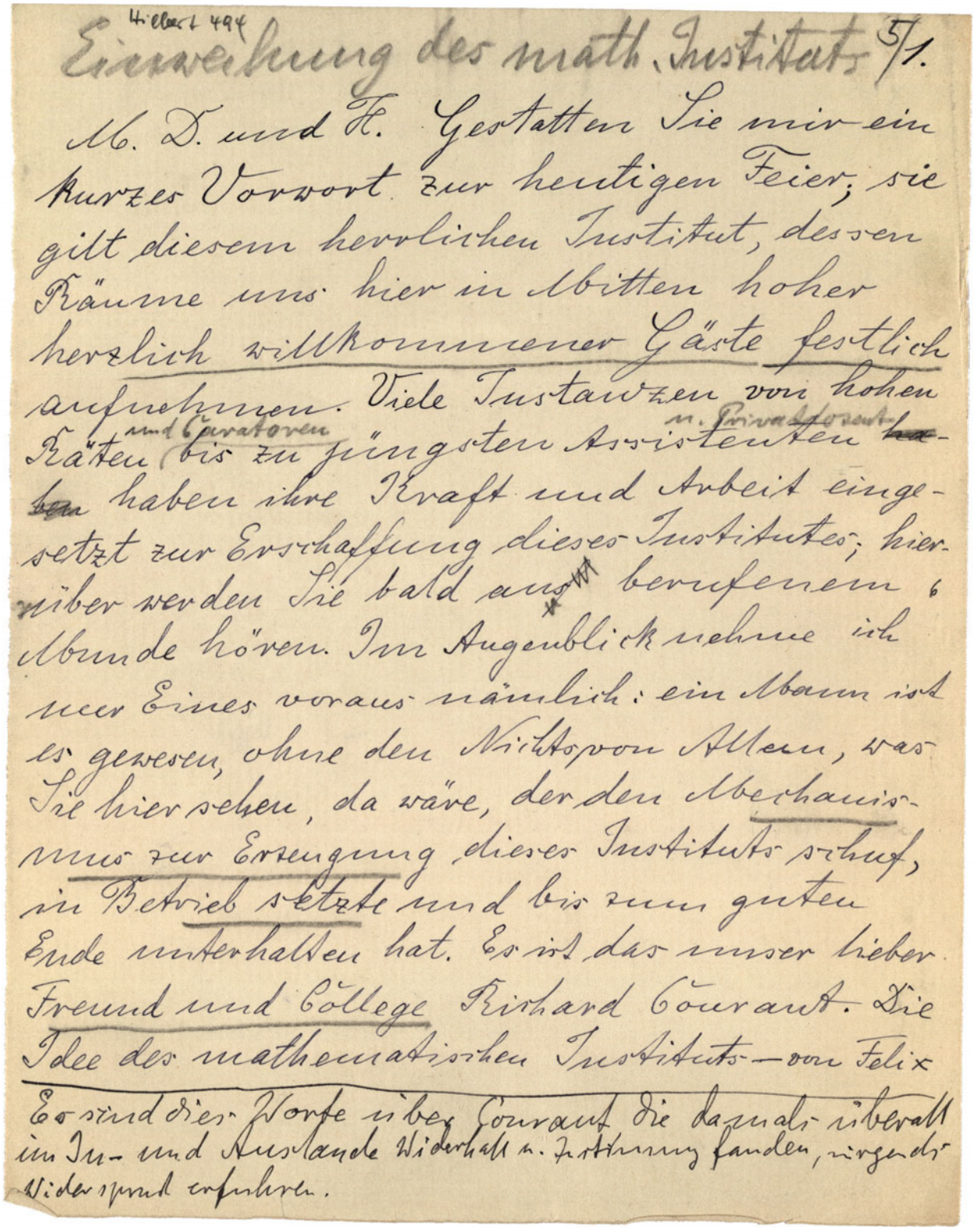
P. Bernays's publications cover a variety of areas of mathematical science: the representation of positive integers by binary quadratic forms (dissertation supervised by Landau), elementary theory of Landau's function of Picard's theorem (habilitation thesis in Zurich), Legendre's condition in the calculus of variations, one-dimensional gas as an example of an ergodic system, axiomatic treatment of Russell's propositional calculus (habilitation thesis, Göttingen, not printed). Several papers on philosophical topics, in "Abhandlungen der Friessschen [sic] Schule".
All this scientific work is characterized by thoroughness and solidity. Often it focuses on a specific fundamental question requiring elucidation, which is analyzed with astuteness and foresight, or on an existing important difficulty that is then overcome with great skill. Bernays's knowledge is extraordinarily broad and deep, and it extends into the domains of philosophy, physics, and biology.
He is characterized by a loving dedication to science; beyond that he is a noble-minded person of reliable character, highly esteemed everywhere.
In all problems concerning the foundations of science, above all those of mathematical science, he is the most thorough expert, and in particular the most valued and most successful member of my staff.

Like a number of Hilbert's Jewish students (Otto Toeplitz, Ernst Hellinger, Max Born), Richard Courant (1888-1972) came from Breslau, and he had known some of the others since his school years. After World War I, he received an Extraordinariat at Münster before being appointed to what had once been Felix Klein's chair. Klein and Hilbert both thought that Courant was the right kind of businessman to reorganize the mathematical enterprise in Göttingen.

Richard Courant

Felix Klein had long had a concrete plan for his own mathematical institute in Göttingen. However, the combination of war debt and inflation had made this goal completely unrealistic. Nevertheless, the idea lived on after his death. In the mid-1920s, Courant held negotiations with representatives of the Rockefeller Foundation to obtain financing from outside Germany for a building to house the institute. Courant's efforts were crowned with success, and the new building was opened in December 1929. As David Hilbert emphasized in his address at the ceremonial opening, the realization of this long-standing dream was due in large part to Richard Courant's untiring efforts.

David E. Rowe and Erhard Scholz



Hilbert 494

Einweihung des math. Instituts 5/1.

M. D. und H. Gestatten Sie mir ein kurzes Vorwort zur heutigen Feier; sie gilt diesem herrlichen Institut, dessen Räume uns hier in Mitten hoher herzlich willkommener Gäste festlich aufnehmen. Viele Institutionen von hohen Räten und Curatoren bis zu jüngsten Assistenten u. Privatdozent haben ihre Kraft und Arbeit eingesetzt zur Erschaffung dieses Institutes; hierüber werden Sie bald aus berufenem Munde hören. Im Augenblick nehme ich nur Eines voraus nämlich: ein Mann ist es gewesen, ohne den Nichts von Allem, was Sie hier sehen, da wäre, der den Mechanismus zur Erzeugung dieses Instituts schuf, in Betrieb setzte und bis zum guten Ende unterhalten hat. Es ist das unser lieber Freund und College Richard Courant. Die Idee des mathematischen Institutes — von Felix

Es sind diese Worte über Courant die damals überall im In- und Auslande Widerhall u. Zustimmung fanden, nirgends Widerspruch erfuhren.

Excerpt from Hilbert's speech at the opening of the Mathematical Institute, 5 January 1929

Ladies and Gentlemen,

Allow me a few words of introduction to the celebration we are holding today in honor of this wonderful institute, the halls of which now festively receive us here in the midst of distinguished and welcome guests. From eminent secretaries and curators to young assistants and Privatdozenten, many have invested their energy and labor in the creation of this institute; you will soon be hearing more on this topic from one better qualified than myself. If I may say just one thing at the outset: there is one man without whom nothing of what you see here would have come to be, a man who set in motion the mechanism for the creation of this institute and who maintained it to its successful end. It is our dear friend and colleague Richard Courant.

The idea of this institute, cherished and nurtured by Felix Klein, lived once upon a time and was charming and lovely, like Sleeping Beauty, and we who have been here a while took proud pleasure from it; but the Wicked Witch of inflation put this Sleeping Beauty into a sleep so deep that all forgot about her until Prince Charming Courant awakened her to new life. [...]

Ladies and Gentlemen, realizing the idea of building the institute was a great and difficult task entailing various smaller problems. Courant treated each of these with the same love and devotion, always knowing how to find and cajole the most suitable and understanding man for the task – never taking the stage himself but remaining in the background, so that in many circles his efforts were hardly noticed while each one of those mobilized for the work contributed his share with the same joy as though he had set himself the task.

Everyone should know that the institute is, in reality, his work. And that if he was able to achieve this great success – and here we have the one and only reason for this accomplishment – it was because he put his wholehearted energy in the work from the beginning. And for this reason we want to give him our wholehearted thanks.

On stage and behind the scenes in Göttingen: Otto Blumenthal, Richard Courant, Emmy Noether and Paul Bernays

A special edition of the journal *Die Naturwissenschaften* was published on 27 January 1922 in honor of David Hilbert's 60th birthday.[1] It included a selection of essays in which Hilbert's closest colleagues and ex-students paid homage to his contributions to various fields of mathematics: Otto Toeplitz introduced Hilbert the algebraist, Max Dehn explained his work in geometry, Richard Courant dealt with Hilbert as an analyst and Max Born described what he had accomplished in physics. Paul Bernays closed the circle with reflections on Hilbert's importance for the philosophy of mathematics. These individual aspects were preceded by a biographical sketch in which Otto Blumenthal depicted the creative phases of Hilbert's career as an unprecedented victory march. His admiration for Hilbert's achievements, as well as his sympathy for the man himself, could not be any more evident than in this lively portrait of his teacher.[2]

Contemporary readers must have noticed that all of the authors who contributed to this commemorative publication not only belonged to Hilbert's inner circle but were also Jewish. No one knows today how these authors were selected. We do know that the physicist Arnold Berliner, who had edited the Springer publication *Die Naturwissenschaften* since 1913, knew many of the people in Hilbert's circle personally, especially through his long-standing contacts with Max Born and Albert Einstein. Like Born, Toeplitz and Courant, Berliner came from a Breslau Jewish family. In 1917 it was he who had established contact between Springer and Courant, and this connection had become the initial spark for the famous textbook collection, now called the "Yellow Series". We can be sure that it was Courant, in agreement with Berliner, who played the main role in realizing the Hilbert commemorative publication project.

Like the others except for Bernays, Courant had met his teacher Hilbert while the latter's friend and colleague Hermann Minkowski was still alive. The extraordinarily warm-hearted friendship that bound Hilbert and Minkowski could only have strengthened the great trust and personal affinity the young Jewish mathematicians felt towards Hilbert. Blumenthal noticed how much Minkowski's sudden death on 12 January 1909 affected Hilbert and how much he later missed "his knowledgeable friend and advisor with the both open and critical spirit".[3] In his somewhat wistful 1935 biography of Hilbert, Blumenthal quotes from Hilbert's obituary of Minkowski – "we enjoyed looking for hidden pathways and discovered many a new perspective that appealed to our sense of beauty"[4] – and observes that after Minkowski's death it was Hilbert's students who accompanied him in search of new views. Unfortunately, "they were unable to replace his inimitable, deceased friend".[5]

In his own speech before the Göttingen Mathematical Association on the occasion of his 60th birthday, Hilbert praised his many doctoral students: "With regard to the doctoral topics, it was often enough for me only to pose the question, and the resourcefulness and tenacity of the doctoral candidates brought many works to completion that are still jewels of the literature today." He offered special thanks to his

1 (Berliner 1922: 64-103).
2 It is interesting to compare Blumenthal's 1922 sketch with his somewhat more detailed 1935 biography.
3 (Blumenthal 1935: 416).
4 Ibid.
5 Ibid.

B. Bergmann et al. (eds.), *Transcending Tradition*

assistants: "In the succession of my assistants from [Max] Born – [Ernst] Hellinger [I have] received the greatest help and collaboration, also in technical aspects, to the present day, where I am fortunate that a man like [Paul] Bernays does not disdain to be my assistant." As a matter of fact, Hilbert's success story would have been unthinkable without the productive working conditions he enjoyed in Göttingen. The energetic support of people who remained in the background, like Blumenthal and Bernays, contributed substantially to the success of the Göttingen venture. There were also a few others who assumed leading roles in Göttingen during the Weimar period, particularly Courant and Emmy Noether. As representatives of all the supporting personalities in Hilbert's circle, we will pay homage here to the achievements of these four key figures.

Otto Blumenthal

The son of a physician, Ludwig Otto Blumenthal was born in Frankfurt in 1876. Though his parents were practicing Jews, he converted to Protestantism at the age of 18. After his school-leaving examination, he headed to Göttingen to study medicine but switched to mathematics after the first semester. Four years later, under Hilbert's guidance, he received his doctorate *summa cum laude*. He then took the state examinations in mathematics, physics and chemistry before going to Paris for two years. He returned to Göttingen in 1901 to work on his habilitation thesis.[7] As Hilbert's first doctoral candidate, Blumenthal stood at the outset of the phenomenal Göttingen success story to which he would later actively contribute, though mostly from behind the scenes. His dedication and willingness to devote himself to all aspects of academic life set him apart as the most exemplary of Hilbert's students. Following his appointment to Aachen, he took over as managing editor of *Mathematische Annalen*.

The boom in mathematical productivity in the years before World War I was reflected in the steadily increasing number of publications in the *Annalen*. In the period extending from 1901 to 1919, there were 52 mathematicians who either published at least 100 pages or published no less than five papers of at least 50 pages each.[8] Six of these authors were particularly productive: Luitzen Egbertus Jan Brouwer, Constantin Carathéodory, Adolf Hurwitz, Felix Klein, Edmund Landau and Alfred Loewy, although Klein's publications usually assumed the character of reports. Of the five most productive writers for the *Annalen*, two were foreigners (Brouwer, who was Dutch, worked in Amsterdam, and Carathéodory was a Greek citizen), while Hurwitz, Landau and Loewy were all Jewish. The editorial board of *Mathematische Annalen* was reorganized after the end of World War I. Beginning in 1920, the title page listed four publishers – Felix Klein, David Hilbert, Albert Einstein and Otto Blumenthal –, although the lion's share of the work continued to rest on the shoulders of the managing editor.

In these turbulent times Blumenthal, like many other Jewish liberals, tended toward pacifism. He became a member of the German League for Human Rights and supported the Society of Friends of the New Russia. He also actively promoted the international reconciliation of mathematicians of the hostile nations. Hilbert shared this view while others in Germany, and Brouwer in the Netherlands, thought otherwise. These and other difficulties between Hilbert and Brouwer came to a head in 1928, when Hilbert decided to remove his opponent Brouwer from the editorial staff

6 SUB Göttingen, Handschriftenabteilung, Cod. Ms. D. Hilbert 452b.
7 For more information on Blumenthal's life, see (Felsch 2006).
8 On the following, see (Rowe 2008).

of the *Annalen*.[9] Einstein could not understand why Hilbert was so stubborn in this issue. He thought it would have been by far preferable to let Brouwer have his way. While others on the editorial board wished to avoid an open rupture, Blumenthal remained absolutely loyal to Hilbert, a position that was certainly not easy for him, especially as he had in the past maintained a friendly relationship with Brouwer.

Blumenthal remained managing editor of the *Annalen* until 1938, but tragedy had begun to touch his life five years earlier. Following Hitler's accession to power, Blumenthal was taken into so-called "protective custody" on 27 April 1933. He had been denounced as a communist by the student organization (AStA) of Aachen University. He was released after two weeks in custody but nevertheless no longer allowed to teach. This restriction was also based on political grounds, since as a pre-war civil servant and ex-soldier he could not be dismissed on racial grounds.[10] At the beginning of 1939, he was offered a tutorship at the Delft University of Technology. He had only just arrived in Delft when the Wehrmacht invaded the Netherlands on 10 May 1940. Subsequently, the Blumenthals were forced to move repeatedly, sometimes within the space of a few days. Their last place of residence was Utrecht, where on 13 April 1943 it was announced that the city had to be "free of Jews" by 23 April. All those who wore the yellow star were required to report to the Vught transit camp, which was part of the s'-Hertogenbosch concentration camp. Mrs. Blumenthal found the bestial living conditions in the Vught camp intolerable. During her stay there she suffered a nervous breakdown from which she never recovered. She died on 21 May 1943 in the Westerbork camp. Her husband did not survive the war either: on 12 November 1944, Otto Blumenthal perished in Theresienstadt at the age of 68.[11]

Richard Courant

Blumenthal wrote that when people thought of the "Hilbert School", the first thing that came to mind was Hilbert's circle of followers in the field of analysis, where Hilbert's methods were particularly influential in variational calculus and in the theory of integral equations.[12] This circle included Richard Courant, whose name will be forever linked to that of his teacher, especially because of the classic book they co-authored, *Methoden der mathematischen Physik* [Methods of Mathematical Physics].[13] As a researcher, Courant developed Hilbert's preferred methods of analysis and applied them to differential equations in mathematical physics.

Courant grew up in Breslau in a family unable to provide the children a comfortable childhood. However, he was always inventive and learned at a young age how to extract himself from precarious situations. During the war he was given the opportunity to develop a telegraphic device that could transmit and receive signals on the ground.[14] He was then sent to the front as a technician rather than an ordinary soldier. Even before the end of the war, Courant had discussed his plans for a new series of mathematics monographs with Ferdinand Springer. He had taken advantage of his acquaintance with Arnold Berliner to initiate contact with Springer. In July 1918, Courant informed Springer that he had managed to obtain Hilbert's support for the project.[15] Approximately three months later, Springer met with Courant in the Harz region, where the latter was doing his military service.[16] Springer reacted enthusiastically to Courant's plan to launch an ambitious new textbook series.[17] In the meantime, Courant had put together a staff of co-editors consisting of

9 For more on this, see (Dalen 2005: 599-636), and (Georgiadou 2004: 235-242).
10 His political activities after World War I were also used as arguments for his dismissal; see (Felsch 2006).
11 A detailed report of Blumenthal's last painful years can be found in (Felsch 2006).
12 (Blumenthal 1922: 69).
13 The first volume appeared in 1924 as volume 12 of Courant's "Gelbe Reihe" [Yellow Series].
14 (Reid 1976: 60-68).
15 Courant's letter to Springer, 2 July 1918, see (Remmert 2008).
16 (Sarkowski 1996: 262).
17 (Reid 1976: 69).

physicist Max Born, applied mathematician Carl Runge and the Hamburg geometer Wilhelm Blaschke. As a result, the contract for Courant's new series was signed on 28 November 1918, shortly after the end of the war. The series was called *Die Grundlehren der mathematischen Wissenschaften in Einzeldarstellungen mit besonderer Berücksichtigung der Anwendungsgebiete* (today known as *A Series of Comprehensive Studies in Mathematics*).[18]

When Courant left Münster for Göttingen in 1921 to take over for Erich Hecke, Klein – although he had retired eight years previously – described the situation in a letter to Courant as if Courant were his, Klein's, immediate successor. Hilbert was in complete agreement with Klein's demand that Courant be assigned an important organizational role within the Göttingen enterprise. Hilbert confided to Courant: "Klein read me the letter he sent you and only wants to have it with him so that he may refer to your words [in his meeting] with the minister, [to show] that you intend to support him in organizational matters."[19]

Courant upheld the old Göttingen tradition of Klein and Hilbert as no one before him had managed to do, by securing the economic power of the Springer publishing house for his own aims. Ferdinand Springer was not at all disappointed by the results, since this new mathematical business meant not only financial advantages for his publishing house but also additional prestige. Courant even signed a consultancy contract with Springer, through which he received the not inconsiderable sum of 6,000 marks per year.[20] Under Courant's leadership, fifteen volumes of *Die Grundlehren der mathematischen Wissenschaften* had appeared by 1925. Many of these works were deeply rooted in the Göttingen mathematical tradition of Klein and Hilbert.[21]

As already described, Klein also placed his plans for a building dedicated to the Institute of Mathematics in Courant's hands.[22] Following Klein's death in 1925, Courant found an opportunity to realize Klein's dream by entering into negotiations with a representative of the Rockefeller Foundation.[23] In a letter of 2 October 1926 addressed to a representative of the Rockefeller Foundation, Courant tried to point out Göttingen's historical significance in order to press ahead with his request, just as Klein had done before him: "The close association of mathematics and physics has at all times been a characteristic feature – and the strength – of the Göttingen tradition, in our special sphere. I need only recall the names of Gauss, Weber, Dirichlet, Riemann, H. Minkowski, Felix Klein. The last named entertained for decades the project of establishing a fixed home for mathematics and physics where both sciences would be cared for on the broadest possible basis, and in intimate mutual conjunction. In this way a series of new buildings and establishments has come to the front, [the object of which appears to be] a concentration of all University activities connected with our special domain...."[24]

As the crowning achievement of this old concept of Klein's, an institute of mathematics was envisaged for which concrete plans as well as financing options had existed as early as 1910. With the support of Niels and Harald Bohr, Courant managed to realize this plan and, indeed, in a form that went well beyond Klein's original ideas. According to Harald Bohr, the Göttingen institute was something unique in the world of mathematical research and theory.[25] Very few people were aware of the key role played by Courant in the difficult negotiations with the Rockefeller

18 Zentral- und Landesbibliothek Berlin, Historische Sammlungen, Archiv des Julius Springer-Verlags, Abteilung B [1912-1936], C 67 I.
19 (Reid 1976: 83).
20 (Sarkowski 1996: 264), (Remmert; Schneider 2010).
21 Several volumes in the series bear the names of Klein and Hilbert, although the papers involved were written by others, perhaps on the basis of lecture notes.
22 For more on Klein as a scientific organizer, see (Rowe 2001).
23 See (Siegmund-Schultze 2001: 144-154).
24 (Siegmund-Schultze 2001: 146).
25 (Siegmund-Schultze 2001: 155).

Foundation. At the opening ceremony, with the result before them, Hilbert took the opportunity to praise Courant's behind-the-scenes work. He emphasized that the realization of this old plan was due entirely to Courant's personal engagement: "The idea of this institute - cherished and nurtured by Felix Klein - lived once upon a time and was charming and lovely, like Sleeping Beauty, and we who have been here a while took proud pleasure from it; but the Wicked Witch of inflation put this Sleeping Beauty into a sleep so deep that all forgot about her until Prince Charming Courant awakened her to new life."[26]

Five years later, Courant was suspended together with five of his Göttingen colleagues. Many protests followed, but from then on the doors of the Institute of Mathematics were closed to Richard Courant, who was forced to emigrate to the USA with his family. He began a second career there at the then nearly-unknown New York University. As a result of his active role as an applied mathematician during World War II, he attained an important position within the American mathematical community. After the war, once again through Courant's initiative, a new institute was founded at New York University which would later become the world-famous Courant Institute of Mathematical Sciences.[27]

Emmy Noether

Amalie Emmy Noether was born in Erlangen on 23 March 1882, the first child of Max and Ida (née Kaufmann) Noether.[28] Emmy had three younger brothers; Fritz, born in 1884, would later become a well-known applied mathematician. At the time of her birth, her father was still an Extraordinarius – despite his international reputation as an expert in algebraic geometry.[29] His daughter, whose mathematical talent developed relatively late, had to overcome obstacles even more difficult than religious denomination in order to become a mathematician.

As women who had completed their secondary education were allowed to attend Bavarian universities, Emmy Noether enrolled at Erlangen. She spent the 1903-1904 winter semester as a guest student in Göttingen, where she sat in on lectures by Klein, Hilbert, Minkowski, Blumenthal and Schwarzschild. She then returned to Erlangen, where she completed her doctorate *summa cum laude*. Her dissertation supervisor was her father's long-standing colleague Paul Gordan, once feted as the "King of Invariants". It is therefore hardly surprising that her dissertation topic was related to invariant theory. Afterwards, however, she was inspired to work on modern algebra by the newly-appointed mathematician Ernst Fischer. It took another ten years before her great talent for this new, quite abstract field of mathematics had fully developed.

Noether found her way back to Göttingen during the years of World War I, when Klein and Hilbert worried about a long-term shortage of young teachers. Göttingen therefore offered her a career as a mathematician, though only very gradually at first. On 20 July 1915 she applied for permission to habilitate, even though at this time not a single woman in Germany had been granted a habilitation. The possibility had been considered before, but the Prussian ministry had explicitly barred women from qualifying. Within the Göttingen faculty, too, there was strong resistance to Noether's attempt. Even Edmund Landau expressed fundamental concerns, although he supported her application.

26 Hilbert's speech at the opening of the Mathematical Institute, 5 January 1929, SUB Göttingen, Handschriftenabteilung, Cod. Ms. D. Hilbert 494.

27 On Courant's successful career at New York University, see (Reid 1976).

28 For more information on Emmy Noether's life, see (Dick 1970) and (Kimberling 1981).

29 Max Noether was finally appointed full professor at Erlangen in 1888.

"How simple it would be for us if it were only a question of a man with exactly the same works, lecturing skills and sincere desire. I would find it greatly preferable if the expansion of our teaching program were possible without this requiring the habilitation of a lady. [....] As far as productive achievements are concerned, I have until now had the worst experiences with lady students and believe that the female brain is unsuitable for mathematical production; however, I consider Miss N[oether] to be one of the rare exceptions."[30]

After a fierce controversy in the faculty, the ministry did not allow the application procedure to go ahead. Hilbert then sought and reached an arrangement with the ministry, and Emmy Noether was able to give her first lecture in autumn 1915. The announcement in the program of lectures read: "Invariant Theory: Prof. Hilbert with the support of Miss Dr. Nöther, Monday 4-6, free of charge."

Noether arrived at Göttingen shortly before Einstein's Wolfskehl lectures on the general theory of relativity. After Einstein's lectures, Noether became deeply involved in mathematical questions related to his theories. Until the end of 1916, Hilbert worked towards uniting Einstein's and Gustav Mie's field theories, a project for which he needed Noether's expertise in invariant theory. The following year Klein was also drawn into the venture, since he wanted to investigate certain basic formal problems in relativity theory which Hilbert had left unanswered. In connection with this project, Noether made an indispensable contribution toward a deeper understanding of the laws of conservation in physics. She was spurred into action by Hilbert's claim that there must be a fundamental difference between conservation laws in the general theory of relativity and in traditional physics (including the special theory of relativity).[31] The main results of Emmy Noether's research completely elucidated the issue. The Noether laws have meanwhile become a fundamental part of mathematical physics.[32]

The proceedings regarding Noether's delayed habilitation have already been described. Thus began a one-of-a-kind career in the course of which Noether achieved international renown with her many important contributions to invariant theory, to the theory of ideals and to non-commutative algebra. She became known as the "mother of modern algebra". Her merits as a researcher and lecturer are clearly set forth in the application submitted in 1922 for an appointment as Extraordinarius: "Her scientific reputation is indisputable and if her external career has as yet not progressed then it can have nothing to do with scientific considerations. She is a nearly indispensable colleague for our scientific work. Less suited to the teaching of elementary disciplines to larger groups of students, she exerts a strong scientific appeal on talented students and has significantly advanced several of them, some of whom have in the meantime obtained professorships."[33] Emmy Noether never received a professorship in Germany.

Following her suspension, which took effect on 25 April 1933, Helmut Hasse attempted to have the decision reversed. He collected reference letters from well-known mathematicians and passed them on to the university registrar responsible for ministerial matters. The registrar noted: "As to politics, Miss Noether has, to my knowledge, held Marxist views from the 1918 revolution until today. And while I think it possible that her political position has been more theoretical than committed and practical, I am also convinced that she has such strong sympathy for

30 Edmund Landau, Habilitation of Emmy Noether, 1.8.1915, quoted in (Tollmien 1990:176).
31 On this, see (Rowe 1999).
32 For a detailed description of the history of reception, see (Kosmann-Schwarzbach 2010).
33 Quoted in (Tollmien 1990: 185).

Marxist ideologies and politics that she cannot be expected to stand unreservedly in favor of the national state. With all due regard for the scientific appraisals of Miss Noether, I am not in a position to speak in her favor."[34]

This is not the only example of how political issues played a significant role in Noether's dismissal. Even more surprising is the line of argument employed by twelve doctoral candidates and former students of Emmy Noether in their petition on behalf of their former doctoral supervisor. "It is no accident that all her students are Aryan; this is explained by her understanding of the essence of mathematics, which corresponds particularly closely to Aryan thinking. It is not a question of disjointed, individual equations but rather of recognizing, understanding the whole, and E. Noether manages to do this thanks to the conceptually substantive method which she has developed in recent years."[35] Naturally, the various actions undertaken in favor of Noether accomplished nothing, so that she was forced to look for a position abroad. Through Hermann Weyl's efforts she received an offer to be guest professor at Bryn Mawr women's college in Pennsylvania. In addition to her teaching duties there, she also held weekly lectures at the Institute for Advanced Study in Princeton, New Jersey, where Einstein and Weyl had in the meantime also found employment.

In this new environment, she received recognition of a sort she had never before enjoyed. Richard Brauer believed that "Emmy felt very comfortable" at Bryn Mawr: "She had shipped most of her belongings from Göttingen and set things up extremely nicely and comfortably. Bryn Mawr was proud of her and sought to arrange everything to her taste. A plan had developed to establish a permanent research professorship for her. She had a circle of students who worked with her very diligently on class field theory."[36]

Her sudden death following an operation took all who knew her completely by surprise. Remembering her generous character, former student Bartel L. van der Waerden wrote: "Totally unpretentious and without any vanity, she never claimed anything for herself but rather focused on supporting her students' work. She always wrote introductions for all of us, explaining the main ideas of our work, which we ourselves at first could never understand or articulate with such clarity. She was a true friend to us and, at the same time, a strict, incorruptible judge."[37]

Paul Bernays

Paul Bernays was born in London in 1888, the son of Julius (Jules) and Sarah (née Brecher) Bernays. Soon after his birth, the family moved to Paris for several years and then finally to Berlin, where Bernays spent his youth and his first semesters at university. Bernays was a Swiss citizen; his paternal grandfather had been granted Swiss citizenship in 1886 and had been a co-founder of the first Israelite community in Zurich. After studying engineering for one semester at the Technical University, Bernays enrolled at the University of Berlin for the winter semester of 1907 with mathematics as a major and physics and philosophy as minor subjects. He transferred to Göttingen in 1909, at the same time as Edmund Landau. Bernays wrote his doctoral thesis on analytic number theory under Landau's supervision and was awarded a doctorate in 1912. Later that year, he submitted his habilitation thesis on function theory and Picard's theorem to the University of Zurich. He then

34 University curator Valentin, 9 August 1933, quoted in (McLarty 2005: 443-444).
35 Quoted in (Schappacher 1983: 24).
36 Letter from Brauer to Hasse, 18 April 1935, quoted in (Lemmermeyer; Roquette 2006: 230).
37 (Waerden 1935: 5).

took on a teaching assignment as Privatdozent at the University of Zurich, filling in for Ernst Zermelo, who was ill. In 1917 he accepted an offer from David Hilbert to work as his scientific assistant at Göttingen.

Bernays was Hilbert's personal assistant for the next sixteen years, working with him on the so-called Hilbert Program in the foundations of mathematics. Bernays entered new territory here, in terms of terminology and in many cases also methodologically. He explained and reformulated Hilbert's occasionally vague and, from a modern perspective, unclear questions. The two volumes of *Grundlagen der Mathematik* [Foundations of mathematics], a standard work in mathematical logic, proof theory, metamathematics and recursion theory, were published by Springer in the "Yellow Series" in 1934 and 1939. It has meanwhile become indisputable that the so-called "Hilbert-Bernays" was almost entirely written by Bernays alone.

As a philosopher, Bernays was close to the "Neue Fries'sche Schule" [New Friesian School] around Leonard Nelson and Gerhard Hessenberg, in whose treatises he published various essays. He became a co-founder of the journal *Dialectica*, and in the 1970s he still contributed to the editing of Nelson's collected works. Like Hilbert, Bernays did not view the philosophy of mathematics as a specialty for experts in modern logic but as a field of great importance for epistemology. He therefore worked on findings resulting from research into mathematical foundations, for instance on Gödels' incompleteness theory and Skolem's paradoxes, and on the consequences these findings held for foundational research as well as for human knowledge as a whole.

Like many of his colleagues, Bernays was dismissed in autumn 1933 as a result of the so-called Law for the Restoration of the Professional Civil Service. His assistantship was terminated, and he anticipated the withdrawal of his permission to teach by voluntarily giving it up. Together with his two sisters, he moved to Zurich, where he received various teaching contracts at the ETH [Swiss Federal Institute of Technology] until 1945. He finally became an Extraordinarius at the age of 56, a position which secured his first steady income.

David Hilbert's success story, so beautifully narrated by Otto Blumenthal in his biography, is seemingly unique in the annals of mathematics. His powerful impact, however, can hardly be explained solely on the basis of his own achievements. In order to understand his success, we need to take into consideration the entire circle of those who worked with him in Göttingen. Many of the names of Hilbert's students, colleagues and followers are known, and some of them have taken their own permanent place in the history of mathematics. Reading the essays they dedicated to him on his sixtieth birthday, we can still see just how highly they regarded Hilbert. Our notion of Hilbert's career is inseparably linked with our image of this particularly successful collective of mathematicians, and without the contributions of the Jewish members of this group, the even greater context of "Hilbert's Göttingen" would be entirely unthinkable.

David E. Rowe

Hochzuverehrender Herr Geheimer Regierungsrat

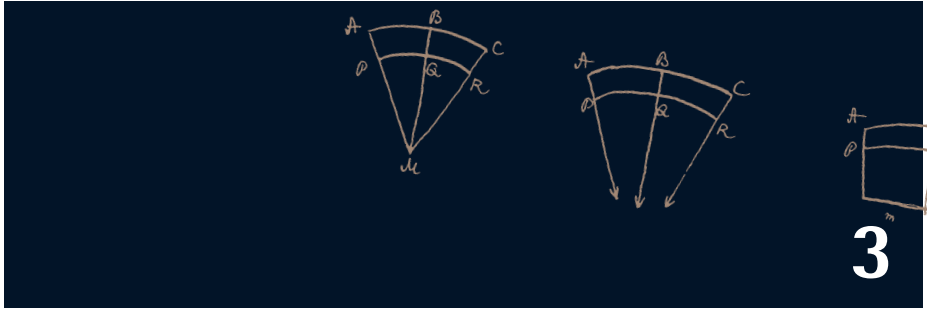
Heute an Ihrem siebzigsten Geburtstage ist es Ihren Schülern ein unabweisbares Bedürfnis des Herzens nicht unter der Zahl der Gratulanten zu fehlen.
Ungezählt sind die Studierenden, welche Sie in einem an Erfolgen so reichen Leben in unsere Wissenschaft eingeführt und ausgebildet, viele sind es die Sie zu selbständiger Forschung angeregt und angeleitet haben. Und wer auch nur ein Semester lang Ihrem Vortrage gefolgt ist, der wird sich stets seiner Bonner Studienzeit mit der grössten Genugthuung erinnern. Deshalb haben wir Jüngeren alle uns an diesem Ehrentag vereint, um Ihnen Herr Geheimrat unsern Dank und unsere wirklich empfundenen Wünsche für Ihr künftiges Wirken und Ihre Gesundheit auszusprechen.

Bonn, den 14. Mai 1902.

I. A.
Rudolf Gebler Otto Fuerth
Ludwig Kurz.

Kunstanstalt Rudolph Schade, Bonn.

Formal letter of thanks from Rudolf Lipschitz's students



3

Bonn

Bonn University had two full professorships for mathematics. The second professorship, however, was sometimes treated as an Extraordinarius (in the years 1869-1892, 1904-1911). In 1892, a regular Extraordinarius was added. Between 1869 and 1935, all professorships in Bonn were repeatedly filled with Jewish mathematicians.

Rudolf Lipschitz (1832-1903) was the first Jewish full professor in Bonn. He occupied the first chair for mathematics from 1869 until 1903. Eduard Study succeeded him. Otto Toeplitz was given the position in 1928 and remained in Bonn until his dismissal in 1935. The second chair was at first occupied by Hermann Kortum. Afterward, this chair successively went to Franz London, Hans Hahn and Felix Hausdorff. The Extraordinarius professorship created in 1892 was occupied, in chronological order, by Hermann Minkowski, Eduard Study, Ludwig Schlesinger, Lothar Heffter, Gerhard Kowalewski, Felix Hausdorff, Issai Schur, Hans Hahn and Hans Beck.

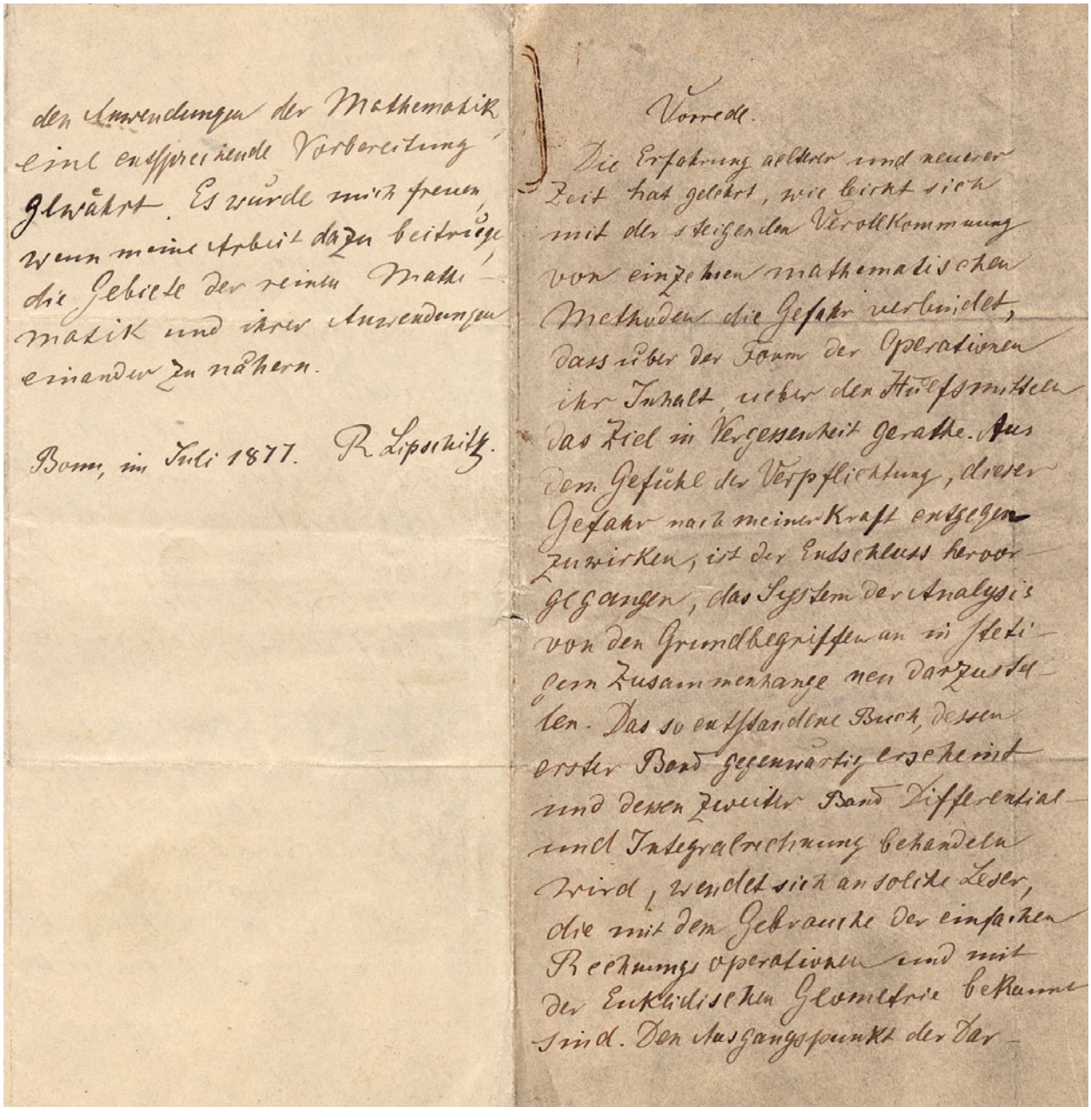
This summary demonstrates that Bonn's reputation as one of the important sites of mathematical culture was upheld primarily by Jewish scholars. Hahn, Hausdorff, Lipschitz, Minkowski, Schlesinger, Schur and Toeplitz were important researchers; in contrast, for the non-Jewish office holders this can only be said of Study and, to a lesser extent, of Heffter and Kowalewski.

B. Bergmann et al. (eds.), *Transcending Tradition*

Rudolf Lipschitz

Rudolf Lipschitz

Over the course of nearly four decades in Bonn, Rudolf Lipschitz's activity unfolded in a broad range of areas. He founded the mathematical seminar, built up the library and successfully established a third position in 1892, thereby enabling Hermann Minkowski to begin his university teaching career. Lipschitz's main achievements lie in the area of differential geometry (differential forms, Riemannian manifolds). His extremely influential textbook, *Grundlagen der Analysis* [Foundations of analysis], put forth the first explanation of the Weierstrassian approach to analysis in textbook form and includes numerous original contributions from the author.



First page of Rudolf Lipschitz's manuscript of *Grundlagen der Analysis* [Foundations of analysis]

Preface.
The experience of times both past and more recent has taught us how easily the increasing refinement of individual mathematical methods puts us at risk of ignoring the content of operations in favor of their form, and their aim in favor of the means. Out of a sense of duty to oppose this danger to the best of my ability, I have decided to give a new and consistently coherent account of the system of analysis, starting from its fundamental concepts....

Franz London

While Franz London (1863-1917) was not an important mathematical researcher, he dedicated his entire energy to teaching and furthering the development of the mathematical institute. In an obituary published in *Jahresbericht der DMV*, Eduard Study wrote, "He was a teacher, body and soul; no effort was too great for him if he could thereby advance his numerous students who followed his lecture with enthusiasm. He dutifully devoted an unusually large amount of his time to them. In the well-thought-out clarity of his explanations, he was a model teacher, a self-sacrificing friend and advisor to his students."[1]

Franz London

London paid an assistant from his own pocket in order to raise the quality of tutorials. In 1917 he arranged for his well-to-do brother-in-law to donate 30,000 marks to the mathematical institute (the Franz London Foundation; this donation would be worth about 250,000 euros today). When his widow Louise London (née Hamburger) emigrated to join their children in England, 49,000 of her 50,000 reichmarks in savings were confiscated. After the war, she had to fight long and hard to obtain a modest widow's pension. Franz and Louise London's son Fritz later became a renowned theoretical physicist.

1 See Eduard Study's obituary for Franz London, in: *Jahresbericht der DMV* 26 (1918:155).

From the statutes of the Franz London Foundation for mathematical research, *Jahresbericht der DMV* 26 (1918), p. 27

Satzungen der Franz London-Stiftung für mathematische Forschung.

§ 1.

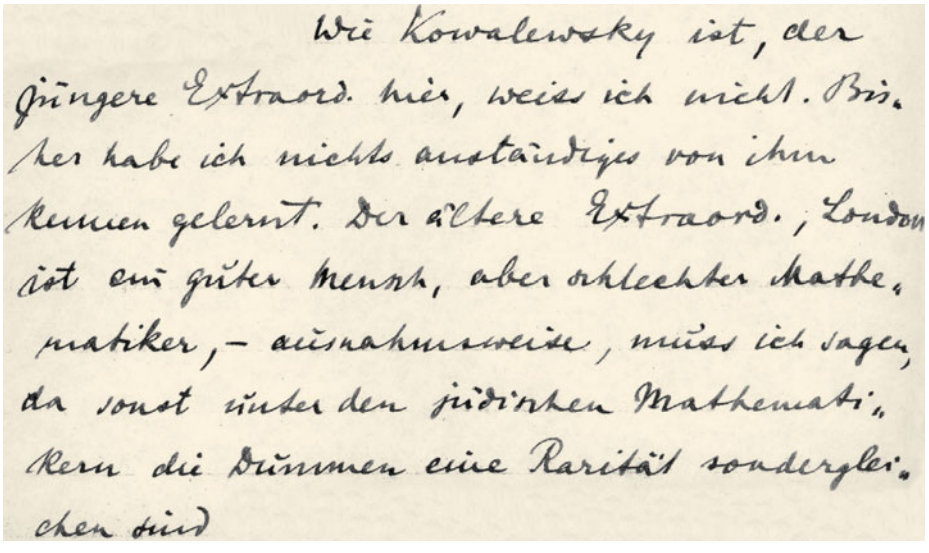
Durch Herrn Alfred Hamburger in Neukirch bei Breslau ist der Bonner Universität die Summe von 30000 Mark übergeben worden als Grundstock eines Vermögens, dessen Zinsen der wissenschaftlichen Forschung im Gebiete der Mathematik zugute kommen sollen. Nach Willen und Stiftungsbrief des Gebers vom 15. Dezember 1916 soll die hiermit begründete und durch Ministerialverfügung vom 19. Februar 1917 bestätigte Einrichtung den Namen Franz London-Stiftung führen, zur dauernden Erinnerung an den hochverdienten Lehrer der Bonner Universität, von dem die Anregung dazu ausgegangen ist.

Statutes of the Franz London Foundation for Mathematical Research.

§ 1.

Mr. Alfred Hamburger from Neukirch near Breslau has handed over to the University of Bonn the amount of 30,000 marks as a basis of a capital, the interest of which is to benefit scientific research in the field of mathematics. According to the wishes of the donor and the deed of donation from 15 December 1916, the institution, which is herewith founded and confirmed by ministerial order from 19 February 1917, is to bear the name Franz London Foundation, in lasting remembrance of the teacher of outstanding merit at the University of Bonn who provided the suggestion for it.

Excerpt of a letter from Gerhard Hessenberg, then a mathematician at the Bonn-Poppelsdorf Agricultural Academy, to his friend, the philosopher Leonard Nelson, 27 September 1907. Both loved sharp-tongued and pointed statements; in their letters they often referred to Felix Klein as "Felix Divus" or "die Zentralstelle" [the central office].



Wie Kowalewsky ist, der jüngere Extraord. hier, weiss ich nicht. Bisher habe ich nichts anständiges von ihm kennen gelernt. Der ältere Extraord., London ist ein guter Mensch, aber schlechter Mathematiker, – ausnahmsweise, muss ich sagen, da sonst unter den jüdischen Mathematikern die Dummen eine Rarität sondergleichen sind

I can't say anything about Kowalewsky, the younger Extraordinarius here. Until now, I haven't learned anything impressive from or about him. The older Extraordinarius, London, is a good person, but a bad mathematician – by way of exception, I must say, as otherwise the dumb are incredibly rare among Jewish mathematicians.

Hans Hahn

Hans Hahn (1879-1934) was a full professor at Bonn University for four years. His teaching and research activities were described as extraordinarily successful. A reference letter for his appointment as full professor stated: "During the short period of his employment here Mr. Hahn has richly fulfilled the hopes placed in him. He has proven to be a devoted, multifaceted, inspiring teacher."[2]

In 1921 Hahn went to Vienna, where he was the hub of a stimulating mathematical life and, among other things, the teacher and doctoral supervisor of Kurt Gödel.

Hahn was also very interested in philosophy. He and philosopher Moritz Schlick founded the so-called Vienna Circle, and he played a crucial role in Schlick's appointment at Vienna.

Hans Hahn

Oeſterreichs berühmteſter Mathematiker geſtorben.

Plötzlicher Tod des Profeſſors Dr. Hahn.

Der ordentliche Profeſſor für Mathematik an der Univerſität Wien Dr. Hans Hahn iſt geſtern im Alter von 54 Jahren nach kurzer Krankheit geſtorben. Profeſſor Hahn, der auf dem Gebiete der Mathematik als Weltautorität gegolten hat, hinterläßt eine Witwe und eine Tochter, die als Schauſpielerin tätig iſt. Profeſſor Hahn hat eine große Anzahl grundlegender Abhandlungen verfaßt und war Mitglied zahlreicher wiſſenſchaftlicher Körperſchaften des In- und Auslands.

Nachdem er an der Univerſität Wien ſeine Studien abſolviert und dieſe in der klaſſiſchen Stadt der Mathematiker, in Göttingen, ergänzen und vervollkommnen durfte, wurde er Privatdozent in Wien, dann nahm er eine Profeſſur an der Univerſität in Czernowitz an, wirkte eine Weile in Bonn in gleicher Eigenſchaft und wurde ſpäter wieder in ſeine Heimatſtadt an die Univerſität Wien berufen, wo er als Ordinarius ſeines Faches bis auf die letzten Tage ſeines Lebens eine ebenſo erſprießliche Lehr- wie Forſchertätigkeit entfaltete.

Report in an Austrian newspaper on Hans Hahn's sudden death

Austria's most famous mathematician passed away
Sudden death of Professor Dr. Hahn
The full professor of mathematics at the University of Vienna, Dr. Hans Hahn has died yesterday at the age of 54 years after a brief illness. Professor Hahn who was world-wide deemed pre-eminent in the field of mathematics, is survived by his widow and a daughter who is an actress. Professor Hahn wrote a large number of ground-breaking treatises and was a member of numerous scientific corporations at home and abroad.
After having studied at the University of Vienna, and completing and perfecting his studies at Göttingen, the classical city of mathematicians, he became a Privatdozent in Vienna. After that he accepted a professor's chair at the University in Czernowitz. Next he was in Bonn for some time, also as a professor, and eventually he was offered a chair back in his native city at the University of Vienna where, as a full professor in his discipline, he was highly productive in teaching and research until the last days of his life.

2 See reference letter for the appointment of Hans Hahn, Universitätsarchiv Bonn, Akten der Philosophischen Fakultät.

The Ernst Mach Association was supported by the members of the Vienna circle and appealed to a broad cross-section of the Viennese population.

VEREIN ERNST MACH

SEKRETARIAT: WIEN I.
WIPPLINGERSTRASSE 8

Wien, Datum des Poststempels
Telephon U 24-3-10

An alle Freunde wissenschaftlicher Weltauffassung!

Der Verein Ernst Mach bemüht sich, alle zu sammeln, die als Vertreter wissenschaftlicher Weltauffassung an die Stelle metaphysischer Systemphilosophie die Einheitswissenschaft setzen wollen, welche Physik, Biologie, Psychologie, Nationalökonomie, Geschichte in gleicher Weise umfaßt. So sollen gedankliche Werkzeuge des modernen Empirismus geformt werden, deren auch die öffentliche und private Lebensgestaltung bedarf.

Der Verein Ernst Mach weiß sich dabei eins mit vielen führenden Geistern unseres Zeitalters, die ferne von einander leben und wirken, er weiß sich aber auch eins mit breiten Kreisen, die wissenschaftlicher Weltauffassung vertrauensvoll gegenüberstehen. Wir laden alle ein, welche die Wichtigkeit dieser wissenschaftlichen Bestrebungen einsehen, dem Vereine als Mitglieder beizutreten.

Niemand schließe sich aus!

Obmänner: Univ.-Professor Moritz Schlick, Univ.-Professor Hans Hahn
Schriftführer: Museumsdirektor Otto Neurath, Univ.-Dozent Rudolf Carnap
Kassiere: Oberlehrer Ronzal, Rechtsanwalt Schönfeld
Sekretäre: Stadtschulrat Kundermann, Kustos Jodlbauer.

Der Verein Ernst Mach hat in seinem Gründungsjahr 1929 folgende Vorträge veranstaltet: Rudolf Carnap: Scheinprobleme der Philosophie (von Seele und Gott); Josef Frank: Moderne Weltauffassung und moderne Architektur; Philipp Frank: Reiseeindrücke über wissenschaftliche Weltauffassung in Rußland; Hans Hahn: Überflüssige Wesenheiten (Occams Rasiermesser); Heinrich Vokolek: Begabungslehre und Vererbungsproblem.

Der zahlreiche Besuch dieser wissenschaftlichen Einzelvorträge veranlaßt uns, im Jahre 1930 die Vortragstätigkeit in verstärktem Maße fortzusetzen. Es werden folgende Vorträge im großen Hörsaal des Pädagogischen Institutes der Stadt Wien, VII, Burggasse 16, 7 Uhr abends, an jedem ersten und dritten Dienstag im Monat veranstaltet:

4. Februar	**Otto Neurath,** Museumsdirektor Einheitswissenschaft und Marxismus	15. April	**Wladimir Misar,** Professor Probleme der Astronomie
18. Februar	**Moritz Schlick,** Universitätsprofessor Reiseeindrücke über wissenschaftliche Weltauffassung in U. S. A.	6. Mai	**Friedrich Waismann,** Volkshochschuldozent: Das Wesen der Logik.
4. März	**Hans Hahn,** Universitätsprofessor Mathematik, Logik und Empirie	20. Mai	**Rudolf Carnap,** Univ.-Dozent Einheitswissenschaft auf physischer Basis
18. März	**Herbert Feigl,** Volkshochschul-Doz. Naturgesetz und Willensfreiheit	3. Juni	**Edgar Zilsel,** Professor Der Geniekult — ein soziologisches Problem
1. April	**Otto Bauer,** Schriftsteller Industr. Rationalisierung u. Wissenschaft	17. Juni	**Josef Friedjung,** Univ.-Dozent Unwissenschaftliches in der Erziehung

Ueber seine Aufgabe berichtet der Verein Ernst Mach in seiner Veröffentlichung „Wissenschaftliche Weltauffassung — Der Wiener Kreis". Verlag Artur Wolf, Wien. Preis 2 Schilling. (Für Mitglieder des Vereines Ernst Mach 1 Schilling). Die Broschüre wird vom Sekretariat nach Voreinsendung des Betrages zugesendet.

THE ERNST MACH ASSOCIATION

Vienna, date of postmark
Telephon U 24.3.10

OFFICE: VIENNA I.
WIPPLINGER ST. 8

To all friends of a scientific worldview!
The Ernst Mach Association hopes to become a meeting place for all those who advocate a scientific worldview and want to replace a metaphysical systems philosophy with a unified science including – on an equal level – physics, biology, psychology, economics and history. This will create intellectual tools of modern empiricism which will also be beneficial to our public and private ways of life.
The Ernst Mach Association is aware that it is at one with many leading minds of our age who live and work at great distances from each other. It also knows that it is at one with wide circles of those who have confidence in a scientific worldview. We invite anyone who appreciates the importance of these scientific efforts to join our association.

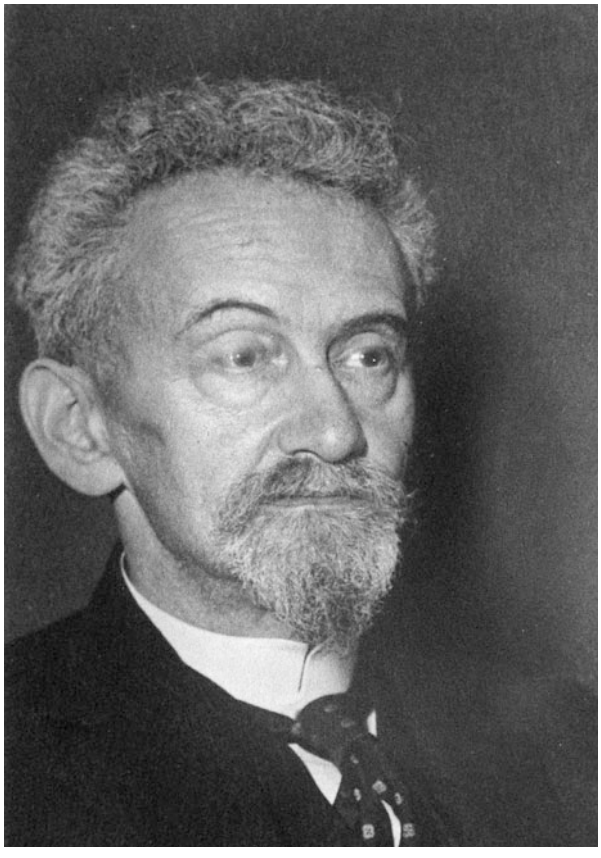
Do not fail to join!

Felix Hausdorff

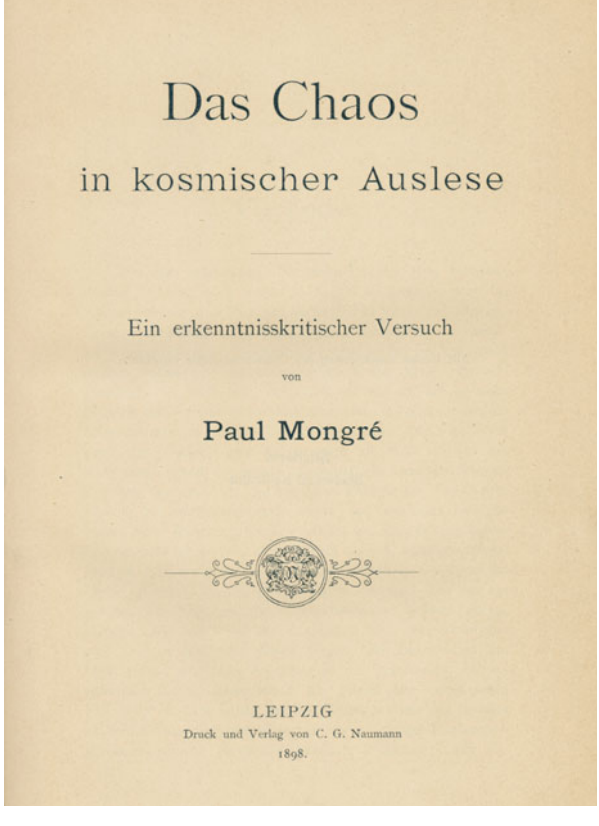
Felix Hausdorff (1868-1942) obtained his habilitation in Leipzig in 1895 with a dissertation on astronomy. He then quickly switched to mathematics. In addition to his academic career as a researcher and teacher, he was also active as a philosophical novelist and man of letters. In 1897, under the pseudonym Paul Mongré, he published a volume entitled *Sant' Ilario. Gedanken aus der Landschaft Zarathustras*, a collection of aphorisms in Nietzschean style. This book was followed by an epistemological monograph called *Das Chaos in kosmischer Auslese* (1898), a volume of poetry, *Ekstasen* (1900), and a grotesque play often successfully produced for the stage, *Der Arzt seiner Ehre* (1904). He also published numerous essays in leading literary magazines.

Hausdorff's book *Das Chaos in kosmischer Auslese* is an attempt to radically expand and perfect Immanuel Kant's critique of metaphysics based on the example of time and space. In it, Hausdorff attempts to prove that the concept of absolute or transcendental space and absolute or transcendental time are completely indeterminate as well as indeterminable, and therefore scientifically meaningless. He writes:

"What real condition of things must be assumed in order for us to believe that we live in a Euclidean space? For a Kantian, both the sense of the question and the answer are indubitable; we know nothing of the things in themselves that correspond to the appearances in the world of our consciousness and, as a result, nothing of the absolute space that generates our image of empirical space. I believe Kant's claim to be correct but his proof for it invalid."[3]

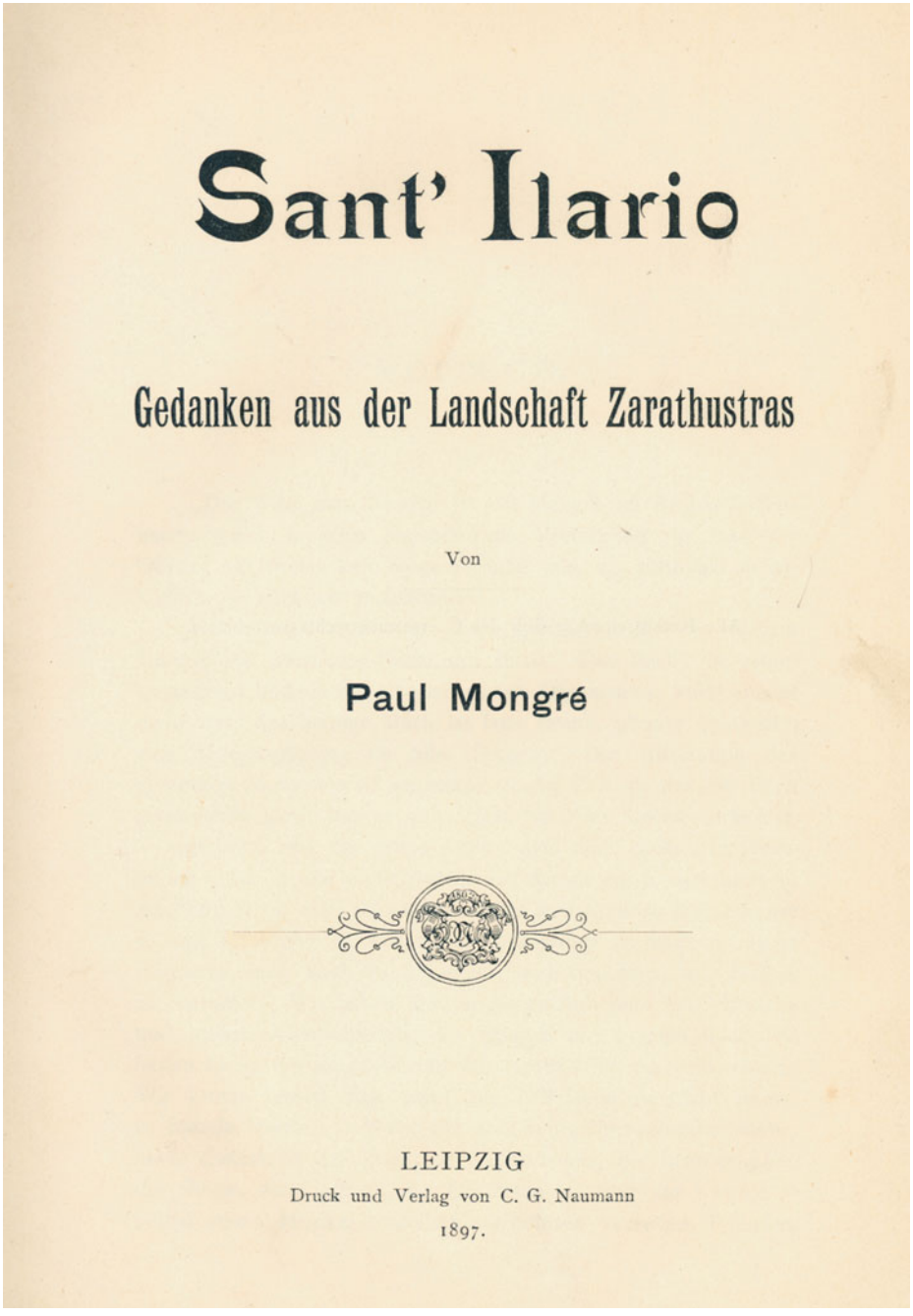


Felix Hausdorff



Paul Mongré's epistemological monograph

3 See (Hausdoff 1903: 14).



Sant' Ilario

Gedanken aus der Landschaft Zarathustras

Von

Paul Mongré

LEIPZIG
Druck und Verlag von C. G. Naumann
1897.

Title page and excerpts from Paul Mongré's *Sant' Ilario*. The conclusion to aphorism no. 3 on the illusion of absolute truth is particularly interesting if read in the context of the subsequent history of the 20th century, with its numerous dictatorships shaped by ideologies claiming to possess absolute truth.

zwischen dem Erhabnen und dem Lächerlichen wandelt, fehlt es gerade an diesem Einen, das eigentlich das Venerabile im Charakter ausmacht; er ist keiner von den Hoffenden, die irgend ein goldenes Kleinod von Wunsch und Sehnsucht dem Gange der Zeit vorauswerfen. Im Gegentheil hat Schopenhauer eine gewisse Meisterschaft darin, der Zukunft ihren Sinn zu rauben und überall die Grundüberzeugung durchscheinen zu lassen, als ob mit seiner Philosophie die Welt enträthselt, ihr weiteres Fortbestehen also im höchsten Sinne überflüssig sei. Als philosophisches Dogma: weil die Menschheit bereits fähig ist, das Weltziel zu erreichen, d. h. den Willen zu verneinen, und natura nihil frustra facit, darum muss die Menschheit die letzte Objectivationsstufe des Willens sein. Welch ein tyrannischer Gedanke! welche Vergewaltigung der noch unerlebten Zukunft, welche eindeutige und ausschliessliche Interpretation des reichen vielgestaltigen Lebens! — Wenn nicht die Wahrheit selbst, so ist doch der Glaube an die gefundene Wahrheit in gefährlichem Masse lebensfeindlich und zukunftsmörderisch. Noch Keiner von denen, die sich mit Wahrheit begnadet wähnten, hat einen Augenblick gezögert, das grosse Finale oder den grossen Mittag oder irgend einen Endpunkt, Wendepunkt, Gipfelpunkt der Menschheit zu verkünden, d. h. jedesmal allem Künftigen sein Bild, seinen Stempel, seine Beschränktheit aufzuprägen.

4.

Jede Zeit, gekostet mit ihrer eigenen Zunge, schmeckt wie Jetzt; es ist empfindsame Verirrung, sich in irgend eine Vergangenheit oder Zukunft hineinzuwünschen. Ein goldenes Zeitalter ist ein perspectivisches Phänomen, be-

3.

[...]
If not truth itself, then surely the belief in holding truth is to a dangerous degree antagonistic to life and murderous for the future. Not one of those who deluded themselves that they were blessed with the truth hesitated for a moment to pronounce the grand finale, or the great day, or some other end point, turning point, or climax for humanity, and every time this meant that all future humanity was to be molded by their image, their stamp, and their narrowness.

dingt dadurch, dass von einem bleiernen aus nach ihm hingeschaut wird; auch die „Finsterniss“ des Mittelalters ist ein solches Phänomen —: die in ihr Lebenden sahen ebensogut die Sonne wie wir taghellen Gegenwartsmenschen. Verschiebe die Zeit, und du verschiebst dich selbst: zum Schluss seid ihr beide wieder homogen.

5.

Geschichte bewahrt auf, was so bescheiden war, sich kundzugeben. Was schweigen kann, was in sich selbst lebt und darum nicht nöthig findet, in Andern weiterzuleben, wird vergessen, — will vergessen werden. Der letzte Stolz einer Zeit kommt nicht auf die Nachwelt.

6.

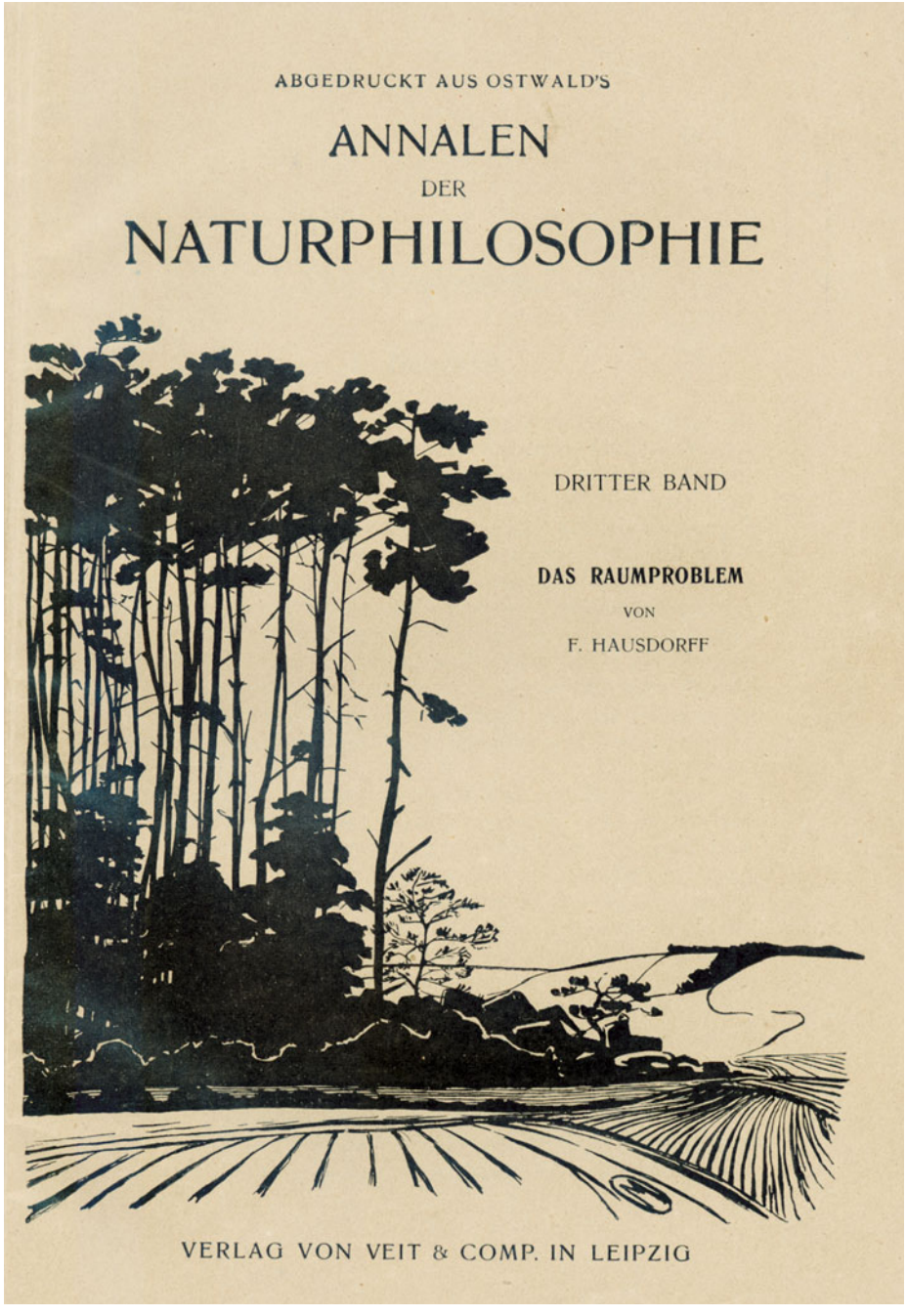
König sein bedeutete früher eine Gefahr vorausshaben, heute — eine Bequemlichkeit! Auf „niederen“ Culturstufen versteht es sich von selbst, dass, wo die Anderen einfach aufgeknüpft oder todtgeschlagen werden, der Häuptling braten muss; es giebt eine genaue Rangordnung der Martern, und der Mann von Stand hält darauf, langsamer und complicirter zu sterben als das Gesindel. Heute hat der Häuptling, gegen die gemeinen Krieger gerechnet, das weichere Bett, das geschütztere Zelt, die mildere Gefangenschaft: die „Tragik des Königthums“, von der empfindsame Reactionäre träumen, hat sich auf das ungefährdetere Gebiet der Seelenschmerzen begeben.

7.

Der Mensch ist ein semiotisches Thier; seine Menschheit besteht darin, dass er statt des natürlichen Ausdrucks

6.

Being a king earlier on meant taking the lead when it came to facing danger, while today – it means being ahead in terms of comfort. At “lower” cultural levels it is normal for the chieftain to get roasted while the others simply get hanged or beaten to death; there is a precise ranking in torture, and a man of rank attaches importance to dying more slowly and in a manner more sophisticated than the rabble. Today, the headman, compared to the ordinary warriors, enjoys a softer bed, a tent better sheltered, a milder form of captivity: the “tragic quality of kingship”, the stuff of the dreams of sentimental reactionaries, has shifted to the less dangerous area of psychalgia.



Special edition of Felix Hausdorff's 1903 inaugural lecture in Leipzig

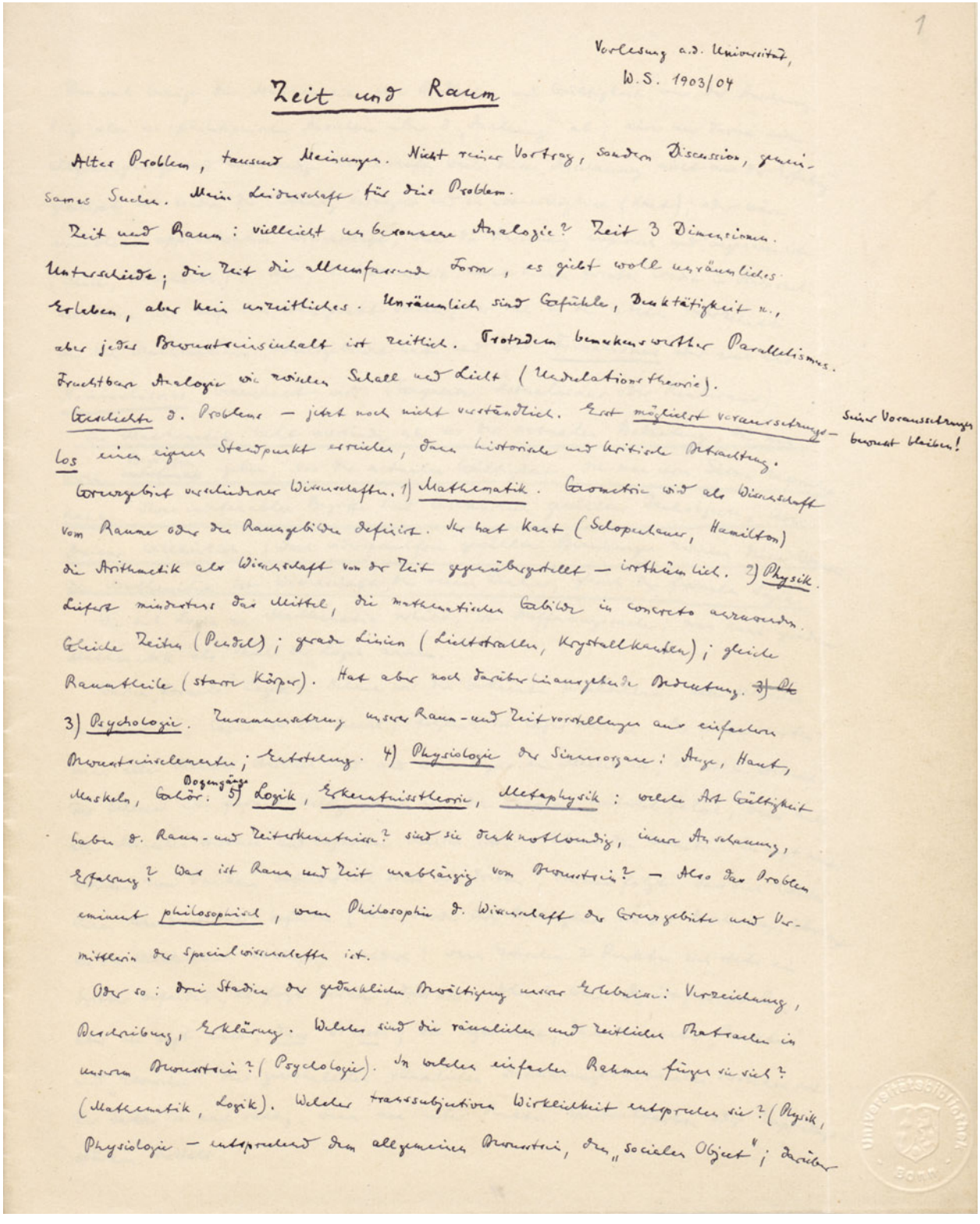
His inaugural lecture in Leipzig, published in *Ostwald's Annalen der Naturphilosophie*, was also devoted to the problem of space. In the winter semester of 1903-04, he gave a lecture course entitled "Zeit und Raum", which was open to a broad audience.

From 1901 onwards, inspired by his discovery that the class of countable order types has the cardinality of the continuum, Hausdorff worked intensively on the theory of ordered sets. In 1904, he published the recursion formula for the exponentiation of alephs that would later bear his name. Hausdorff introduced the concept of "cofinality" and made a distinction, for the first time, between regular and singular cardinals. His question as to whether there were regular cardinals with limes ordinals as index eventually led to the development of the theory of inaccessible cardinals.

Other important contributions of Hausdorff include his maximal chain theorem, his theory of element and gap characters, the theory of general products, which led to partial orders, the discovery of saturated structures and, in connection with this, the first formulation of the generalized continuum hypothesis, and finally, the discovery of the spaces later named after him. In his 1908 report on the development of set theory, Arthur Schoenflies gave credit to Hausdorff for the entire higher theory of ordered sets. Hausdorff's long paper "Grundzüge einer Theorie der geordneten Mengen" (published in *Mathematische Annalen* in 1908) was the first comprehensive presentation of results obtained in this field.

Time and Space

Old problem, thousands of opinions. Not purely lecture, but discussion, joint search. My passion for this problem.
Time and space: perhaps imprudent analogy? Time 3 dimensions. Differences; time the all-encompassing form, there may well be non-spatial experience, but none that is not temporal. Feelings, thinking activity, etc., are non-spatial, but all content of consciousness is temporal.
Still, remarkable parallelism. Fruitful analogy, such as between sound and light. (Undulatory theory). History of the problem – may not yet be grasped. To begin with, reach an own position as free of assumptions as possible. [Marginal note: "to remain aware of one's assumptions!"], then historical and critical considerations. Border area between different sciences. 1) Mathematics. Geometry is defined as the science of space or of spatial figures. Kant (Schopenhauer, Hamilton) has juxtaposed to it arithmetic as the science of time – erroneously. 2.) Physics. Provides at least the means to apply the mathematical figures in concreto. Equal times (pendulum); straight lines (rays of light, crystal edges); equal parts of space (rigid body). But has meaning beyond that. 3.) Psychology. Composition of our ideas of space and time from simple elements of consciousness; origin. 4.) Physiology of the sensory organs: eye, skin, muscles, hearing/semicircular canals. 5.) Logic, epistemology, metaphysics: what kind of validity does knowledge of space and time possess? Is it necessary thought, inner intuition, experience? What are space and time independently of consciousness? – Thus, the problem is eminently philosophical, if philosophy is the science of border areas and a mediator of the special sciences.
Or: three stages of intellectually coping with our experienes:
Recording, description, explanation. Which are the spatial and temporal facts within our consciousness? (Psychology). Into which simple frame will they fit? (Mathematics, logic). To which transsubjective reality do they correspond? (Physics, physiology – corresponding to general consciousness, the "social object"; [...]).



1

Vorlesung a.d. Universität,
W.S. 1903/04

Zeit und Raum

Altes Problem, tausend Meinungen. Nicht reiner Vortrag, sondern Discussion, gemeinsames Suchen. Mein Leidenschaft für dies Problem.

Zeit und Raum: vielleicht unbewusste Analogie? Zeit 3 Dimensionen. Unterschiede; die Zeit die allumfassende Form, es giebt wohl unräumliches Erleben, aber kein unzeitliches. Unräumlich sind Gefühle, Thätigkeit u., aber jeder Bewusstseinsinhalt ist zeitlich. Trotzdem bemerkenswerther Parallelismus. Fruchtbare Analogie die zwischen Schall und Licht (Undulationstheorie).

Geschichte d. Problems – jetzt noch nicht verständlich. Erst möglichst voraussetzungslos einen eigenen Standpunkt erwerben, dann historische und kritische Betrachtung.

Seine Voraussetzungen bewusst bleiben!

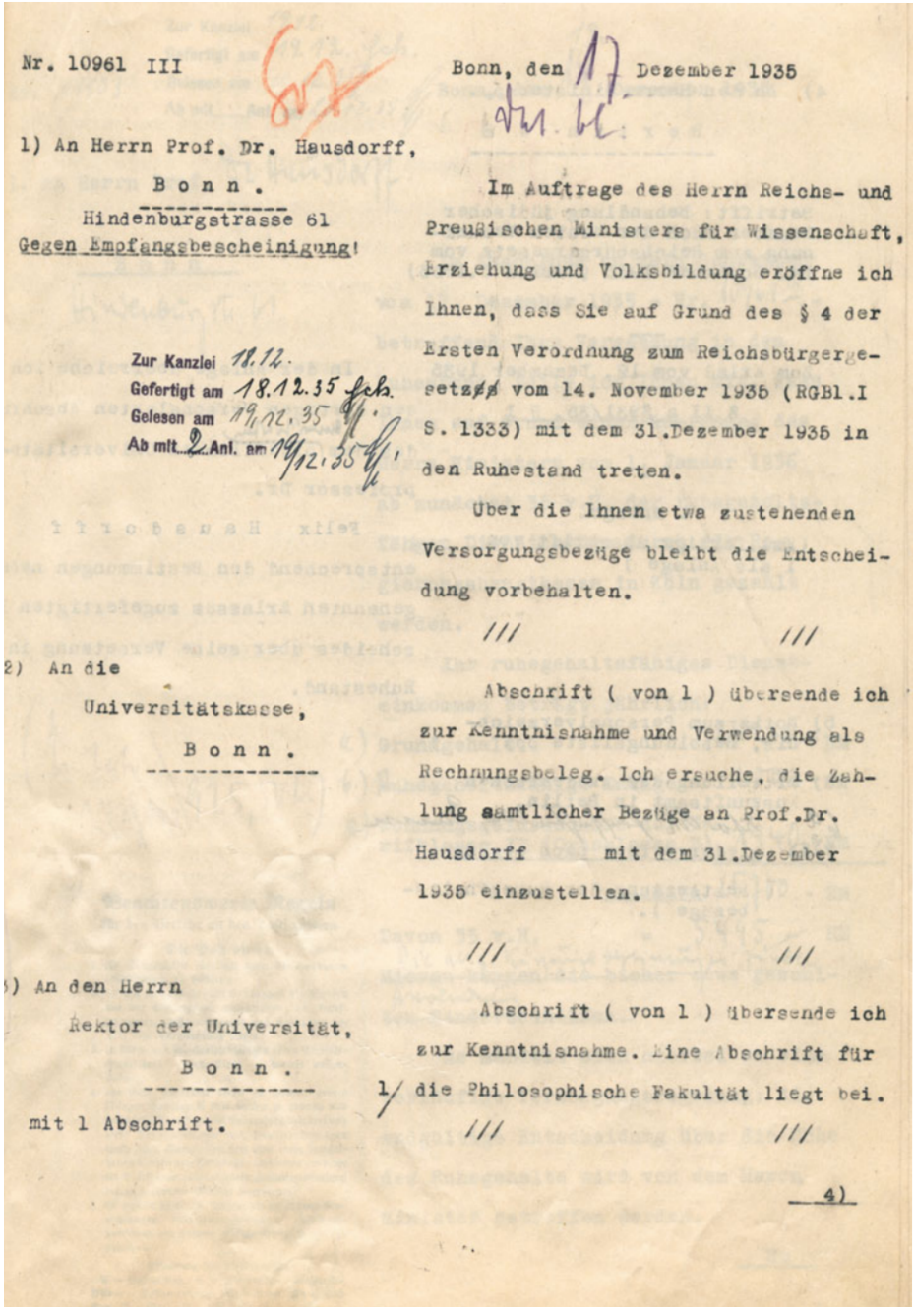
Gebiet verschiedener Wissenschaften. 1) Mathematik. Geometrie wird als Wissenschaft vom Raume oder des Raumgebildes definirt. So hat Kant (Schopenhauer, Hamilton) die Arithmetik als Wissenschaft von der Zeit gegenübergestellt – irrthümlich. 2) Physik. Liefert mindestens das Mittel, die mathematischen Gebilde in concreto aufzusuchen. Gleiche Zeiten (Pendel); gerade Linien (Lichtstrahlen, Krystallkanten); gleiche Raumtheile (starre Körper). Hat aber noch darüberhinausgehende Bedeutung. ~~3) Ph~~

3) Psychologie. Zusammensetzung unserer Raum- und Zeitvorstellungen aus einfachen Bewusstseinselementen; Entstehung. 4) Physiologie der Sinnesorgane: Auge, Haut, Muskeln, Gehör. Dogmengesch. 5) Logik, Erkenntnisstheorie, Metaphysik: welche Art Gültigkeit haben d. Raum- und Zeitbegriffe? sind sie denknothwendig, innere Anschauung, Erfahrung? Was ist Raum und Zeit unabhängig vom Bewusstsein? – Also das Problem eminent philosophisch, wenn Philosophie d. Wissenschaft der Grenzgebiete und Vermittlerin der Specialwissenschaften ist.

Oder so: drei Stadien der gedanklichen Bewältigung unserer Erlebnisse: Verzeichnung, Beschreibung, Erklärung. Welches sind die räumlichen und zeitlichen Charaktere in unserm Bewusstsein? (Psychologie). In welchen einfachen Rahmen fügen sie sich? (Mathematik, Logik). Welcher transsubjectiven Wirklichkeit entsprechen sie? (Physik, Physiologie – entsprechend dem allgemeinen Bewusstsein, dem „socialen Object"; darüber

First page of Hausdorff's lecture manuscript "Zeit und Raum" [Time and space], Leipzig 1903

Letter from the administration of the University of Bonn to Hausdorff (December 1935) regarding his forced retirement



Nr. 10961 III

Bonn, den 17. Dezember 1935

1) An Herrn Prof. Dr. Hausdorff,
Bonn.
Hindenburgstrasse 61
Gegen Empfangsbescheinigung!

Zur Kanzlei 18.12.
Gefertigt am 18.12.35 Sch.
Gelesen am 19.12.35
Ab mit 2 Anl. am 19/12.35

Im Auftrage des Herrn Reichs- und Preußischen Ministers für Wissenschaft, Erziehung und Volksbildung eröffne ich Ihnen, dass Sie auf Grund des § 4 der Ersten Verordnung zum Reichsbürgergesetz vom 14. November 1935 (RGBl.I S. 1333) mit dem 31.Dezember 1935 in den Ruhestand treten.

Über die Ihnen etwa zustehenden Versorgungsbezüge bleibt die Entscheidung vorbehalten.

/// ///

2) An die
Universitätskasse,
Bonn.

Abschrift (von 1) übersende ich zur Kenntnisnahme und Verwendung als Rechnungsbeleg. Ich ersuche, die Zahlung sämtlicher Bezüge an Prof.Dr. Hausdorff mit dem 31.Dezember 1935 einzustellen.

/// ///

) An den Herrn
Rektor der Universität,
Bonn.
mit 1 Abschrift.

Abschrift (von 1) übersende ich zur Kenntnisnahme. Eine Abschrift für die Philosophische Fakultät liegt bei.

1/

/// ///

4)

On behalf of the Reich and Prussian Minister for Science and Public Education, you are hereby informed that based on § 4 of the First Ordinance of the Reich Citizenship Law [Part of Nuremberg Laws] dated 14 November 1935 Reichsgesetzblatt (RGBl. I, p. 1333) you will be retired on 31 December 1935.

...

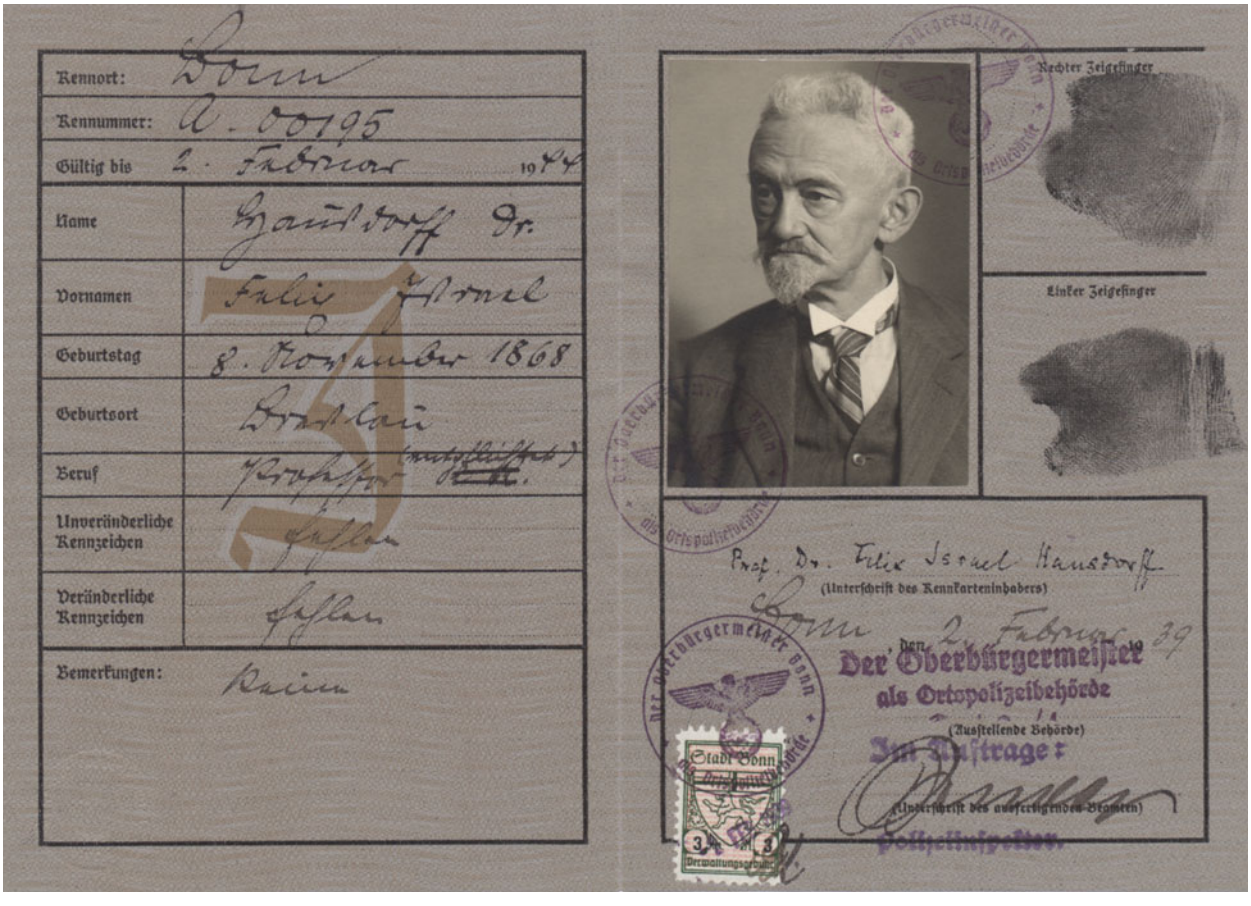
I request that all payments to Prof. Dr. Hausdorff are ceased by 31 December 1935.

On 31 March 1935, after a bit of wrangling, Hausdorff was finally made professor emeritus; there was no word of thanks for his more than 40 years of successful service in the German university system. With the enactment of the first decree of the Reich Citizenship Law (Nuremberg Laws) in late 1935, he was forcibly retired. Compared to university retirement, this meant a drastic reduction in his pension.

After the "Reichskristallnacht" of 1938, Jews were required to hand in their passports. In return they received an identity document, the so-called "Kennkarte J", or "J identity card". Moreover, they were now forced to take on additional middle names: "Israel" for men and "Sarah" for women. Registry offices also had to enter these forced middle names in their files.

Beginning in 1941, the Jews of Bonn were taken to a cloister (Kloster zur Ewigen Anbetung) in Bonn-Endenich, that the nuns had been forced to leave, and from there they were deported to extermination camps.

Felix Hausdorff's "J identity card" with the forced signature "Felix Israel Hausdorff"



On the evening before Hausdorff, his wife and her sister committed suicide together – they were facing internment in Endenich – Hausdorff wrote a farewell letter to his friend, the Jewish lawyer Dr. Hans (Lot) Wollstein. Hausdorff's best wishes for Wollstein were not to be fulfilled. On 27 July 1942, Wollstein was deported to Theresienstadt and from there to Auschwitz, where he was killed. The date of his death is unknown.

Bonn, 25. Jan. 1942

Liebe Freund Wolfstein!

Wenn Sie diese Zeilen erhalten, haben wir das Problem auf andere Weise gelöst – auf die Weise, von der Sie uns beständig abzubringen versucht haben. Das Gefühl der Geborgenheit, das Sie uns vorausgesagt haben, wenn wir erst einmal die Schwierigkeiten des Umzugs überwunden hätten, will sich trotzdem nicht einstellen, im Gegenteil:

auch Endenich
ist noch vielleicht das Ende nicht!

Was in den letzten Monaten gegen die Juden geschehen ist, erweckt begründete Angst, dass man uns einen für uns erträglichen Zustand nicht mehr erleben lassen wird.

Sagen Sie Philippsons, was Sie für gut halten, nebst dem Dank für ihre Freundschaft (der vor allem aber Ihnen gilt). Sagen Sie auch Herrn Mayer unseren herzlichen Dank für alles, was er für uns getan hat und gegebenenfalls noch getan haben würde;

wir haben seine organisatorischen Leistungen und Erfolge aufrichtig bewundert und hätten uns, wäre jene Angst nicht, gern in seine Obhut gegeben, die ja ein Gefühl relativer Sicherheit mit sich gebracht hätte, – leider nur einer relativen.

Wir haben mit Testament vom 10. Okt. 1941 unseren Schwiegersohn Dr. Arthur König, Jena, Richard-Wagner-Str. 14, zum Erben eingesetzt. Helfen Sie ihm, soweit Sie können, lieber Freund! helfen Sie auch unserer Hausangestellten Anna Nickol oder wer sonst Sie darum bittet; unseren Dank müssen wir ins Grab mitnehmen. Vielleicht können nun die Möbel, Bücher usw. noch über den 29. Jan. (unseren Umzugstermin) in Haus bleiben; vielleicht kann auch Frau Nickol noch bleiben, um die laufenden Verbindlichkeiten (Rechnung der Stadtwerke usw.) abzuwickeln. – Steuerakten, Bankkorrespondenz usw. Vgl., was Arthur braucht, befindet sich in meinem Arbeitszimmer.

Felix Hausdorff's farewell letter

Wenn es geht, wünschen wir mit Feuer bestattet zu werden und legen Ihnen drei Erklärungen dieses Inhalts bei. Wenn nicht, dann muss wohl Herr Mayer oder Herr Goldschmidt das Notwendige veranlassen[x]. Für Bestreitung der Kosten werden wir, so gut es geht, sorgen; meine Frau war übrigens in einer evangelischen Sterbekasse – die Unterlagen dazu befinden sich in ihrem Schlafzimmer. Was augenblicklich an der Kostendeckung noch fehlt, wird unser Erbe oder Nora übernehmen.

Verzeihen Sie, dass wir Ihnen über den Tod hinaus noch Mühe verursachen; ich bin überzeugt, dass Sie tun, was Sie tun können (und was vielleicht nicht sehr viel ist). Verzeihen Sie uns auch unsere Discretion! Wir wünschen Ihnen und allen unseren Freunden, noch bessere Zeiten zu erleben.

Ihr treu ergebener

Felix Hausdorff

x) meine Frau und meine Schwägerin sind aber evangelischer Konfession.

Bonn, 25 January 1942

Dear friend Wollstein!

By the time you receive these lines, the three of us will have solved the problem in another way – the way from which you have constantly sought to dissuade us. The feeling of security that you predicted for us once we had finally overcome the difficulties of the move will never take place, on the contrary:

Auch Endenich
Ist noch vielleicht das Ende nich!

["Also Endenich
is still perhaps not the end!"]

What has been done to the Jews in the last months has awakened a justifiable fear that we will not be allowed to live anymore in circumstances that are tolerable for us. Tell the Philippsons what you think best, along with thanks for their friendship (our thanks go first of all to you). Give Mr. Mayer, too, our heartfelt thanks for what he did for us and, had the occasion arisen, would have done.

We have genuinely admired his organizational achievements and successes, and if this fear hadn't been there, we would have enjoyed placing ourselves in his care, which would have created a sense of relative security – unfortunately only a relative one.

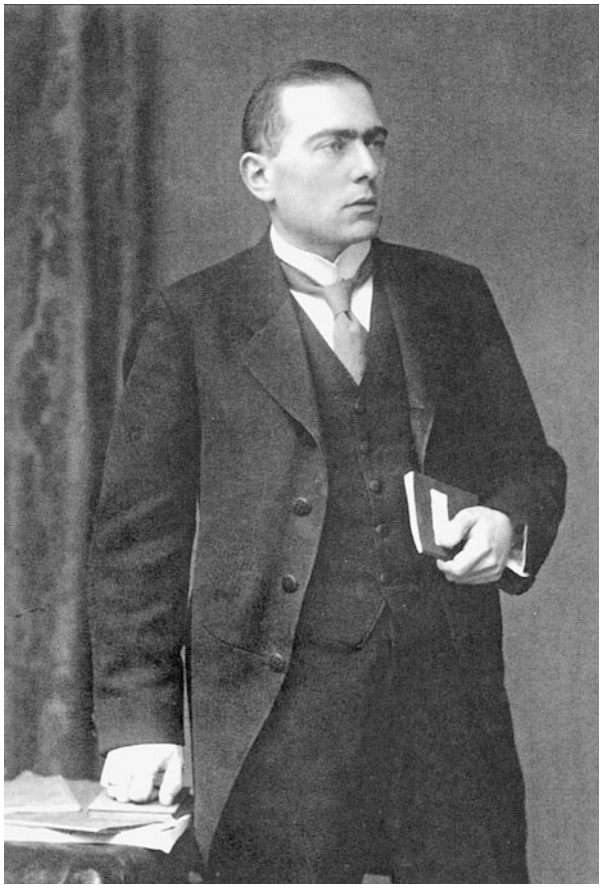
In a last will dated 10 October 1941 we have appointed our son-in-law Dr. Arthur Koenig, current address Jena, Reichartstieg 14, as heir. Help him as far as you can, dear friend! Please also help our housekeeper Minna Nickol, or whoever else asks you for it. We have to take our gratitude to our graves. Maybe the furniture, books, etc. can stay in the house until after the 29 January (our moving date), maybe Mrs. Nickol can stay on to settle the current accounts (utility bills etc.) - Tax files, bank correspondence, etc. whatever Arthur will need, are to be found in my office.

If at all possible, we would like to be cremated, and we have enclosed a letter declaring this. If not, then Mr. Mayer or Mr. Goldschmidt will need to make the necessary arrangements.* We will try to provide for the costs, as best as possible. Actually, my wife used to be a member in a protestant funeral expenses fund, the related documents may be found in her bedroom. Whatever is still missing right now, to meeting the costs, will be borne by our heir or by Nora.

Please accept my apology for the trouble we are causing you even after our death; I am convinced that you are doing what you can (and which is perhaps not much). Also, please forgive our desertion! We hope that you and all our friends will experience better times.

Your faithfully devoted
Felix Hausdorff

* My wife and my sister-in-law are Protestant, however.



Otto Toeplitz

Otto Toeplitz

Mathematics was a tradition in Otto Toeplitz's family. His grandfather, who had studied with Jacobi, had been a mathematics teacher at a Gymnasium; his notes for Jacobi's lectures are still kept at Bonn University archives. Toeplitz's father also taught mathematics.

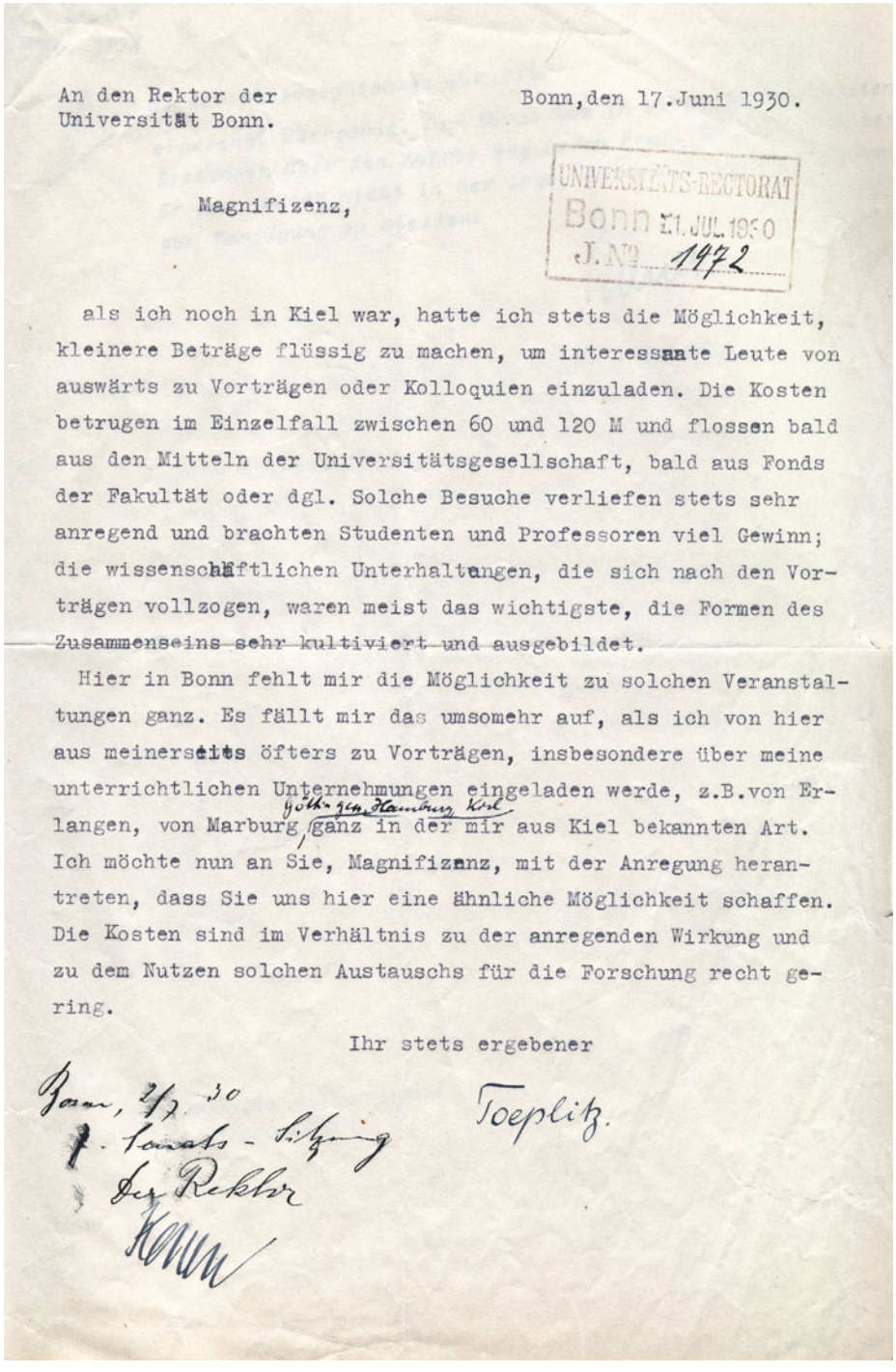
Otto Toeplitz (1881-1940) was one of David Hilbert's students, and he successfully continued the latter's investigations of integral equations. In 1907, Toeplitz obtained his habilitation in Göttingen. He became Extraordinarius in 1913 and was given a full professorship at Kiel in 1920. In 1928, he accepted an appointment to Bonn as Eduard Study's successor. Hausdorff and Toeplitz got along well, and their families were friends. It was during his time in Bonn that Toeplitz began working with the famous mathematician Heinrich Behnke in Münster on mathematic education and the further education of teachers. In Bonn Toeplitz established a seminar for the history of mathematics, together with the historian of mathematics Erich Bessel-Hagen and the philosopher Oskar Becker. He also established the journal *Quellen und Studien zur Geschichte der Mathematik, Astronomie und Physik* with the historian of ancient mathematics Otto Neugebauer and the classical philologist Julius Stenzel.

After 1933, the two Bonn mathematicians Felix Hausdorff and Otto Toeplitz diverged in how they organized their lives in response to the persecution of Jews in Nazi Germany. For Hausdorff sharing in the fate of his fellow Jews meant "helplessly suffering nonsense and wrong",[4] while for Toeplitz in contrast it meant active participation in making that fate more bearable.

On 16 August 1933, Otto Toeplitz was elected to the board of the Bonn Synagogue, an "ultra-lukewarm" community, as he once described it to his wife. In answer to pressure from the rabbi of the community, Dr. Alfred Levy, Toeplitz helped set up a private Jewish primary school such as there had long been in many cities of the Rhineland. In October 1933 Toeplitz became chairman of the newly-established Jewish Culture and School Association, the body intended to run the school, and he assumed the task of negotiating with the education authority. While the intention of the Jewish community was to protect its children from harm in public schools, for the school authorities, in contrast, it was a question of being able to sort out the Jewish children.

The Jewish school, located in the Ludwig Philippson Masonic Lodge, Koblenzer Strasse 32, Bonn, opened on 1 May 1934. The number of pupils rose from 63 in the beginning to 84 in 1935 – which represented nearly the total number of Jewish children attending primary school at the time. Toeplitz remained chairman of the school association until 1936.

4 This is taken from Hausdorff's acrostic for Toeplitz and his wife.



An den Rektor der
Universität Bonn.

Bonn, den 17. Juni 1930.

UNIVERSITÄTS-RECTORAT
Bonn 21. JUL. 1930
J. № 1972

Magnifizenz,

als ich noch in Kiel war, hatte ich stets die Möglichkeit, kleinere Beträge flüssig zu machen, um interessante Leute von auswärts zu Vorträgen oder Kolloquien einzuladen. Die Kosten betrugen im Einzelfall zwischen 60 und 120 M und flossen bald aus den Mitteln der Universitätsgesellschaft, bald aus Fonds der Fakultät oder dgl. Solche Besuche verliefen stets sehr anregend und brachten Studenten und Professoren viel Gewinn; die wissenschaftlichen Unterhaltungen, die sich nach den Vorträgen vollzogen, waren meist das wichtigste, die Formen des ~~Zusammenseins sehr kultiviert und ausgebildet~~.

Hier in Bonn fehlt mir die Möglichkeit zu solchen Veranstaltungen ganz. Es fällt mir das umsomehr auf, als ich von hier aus meinerseits öfters zu Vorträgen, insbesondere über meine unterrichtlichen Unternehmungen eingeladen werde, z.B. von Erlangen, von Marburg, Göttingen, Hamburg, Kiel ganz in der mir aus Kiel bekannten Art. Ich möchte nun an Sie, Magnifizenz, mit der Anregung herantreten, dass Sie uns hier eine ähnliche Möglichkeit schaffen. Die Kosten sind im Verhältnis zu der anregenden Wirkung und zu dem Nutzen solchen Austauschs für die Forschung recht gering.

Ihr stets ergebener

Toeplitz.

Bonn, 2/7. 30
1. Senats-Sitzung
Der Rektor

Today it is normal for every institute to have funds earmarked for inviting guest lecturers. In the 1920s, this was a rare exception. In this letter, Otto Toeplitz attempted to make such possibilities available to the Bonn University mathematical institute. Other files from the archive show that the application was rejected.

To the President of Bonn University

Bonn, 17 June 1930

Magnificence,

When I was still in Kiel, I always had the opportunity to make small sums available, in order to invite interesting people from elsewhere for lecturing or for colloquia. On average, the costs for these events amounted to somewhere between 60 and 120 reichmarks, and were sometimes provided by the

University Association, or by the Faculty Fund, or similar. These visits were always highly inspiring, and beneficial for both students and for professors; the scientific discourse following these events was generally the most important aspect, with highly cultivated and educational gatherings.

Here in Bonn, I do not have the opportunity of organizing such events. I miss it rather acutely, as I am myself frequently invited to lecture about my own teaching activities by universities such as Erlangen, Marburg [handwritten insert: Göttingen, Hamburg, Kiel], where I have held talks similar to those I organized in Kiel. I would now like to ask you, Magnificence, to create similar possibilities for us here. The expenses may be deemed marginal in relation to the inspiring effect and the benefit of such an exchange to research.

Yours sincerely
TOEPLITZ

On occasion of the silver wedding anniversary of Otto and Erna Toeplitz, Felix Hausdorff dedicated a poem to the couple, which he entitled "Sehr schwieriges Akrostichon für das Ehepaar Toeplitz" [A very difficult acrostic for Mr. and Mrs. Toeplitz]. In it, Hausdorff described the couple's work on behalf of the Jewish community in a way that was loving and gently mocking, yet full of respect and admiration.

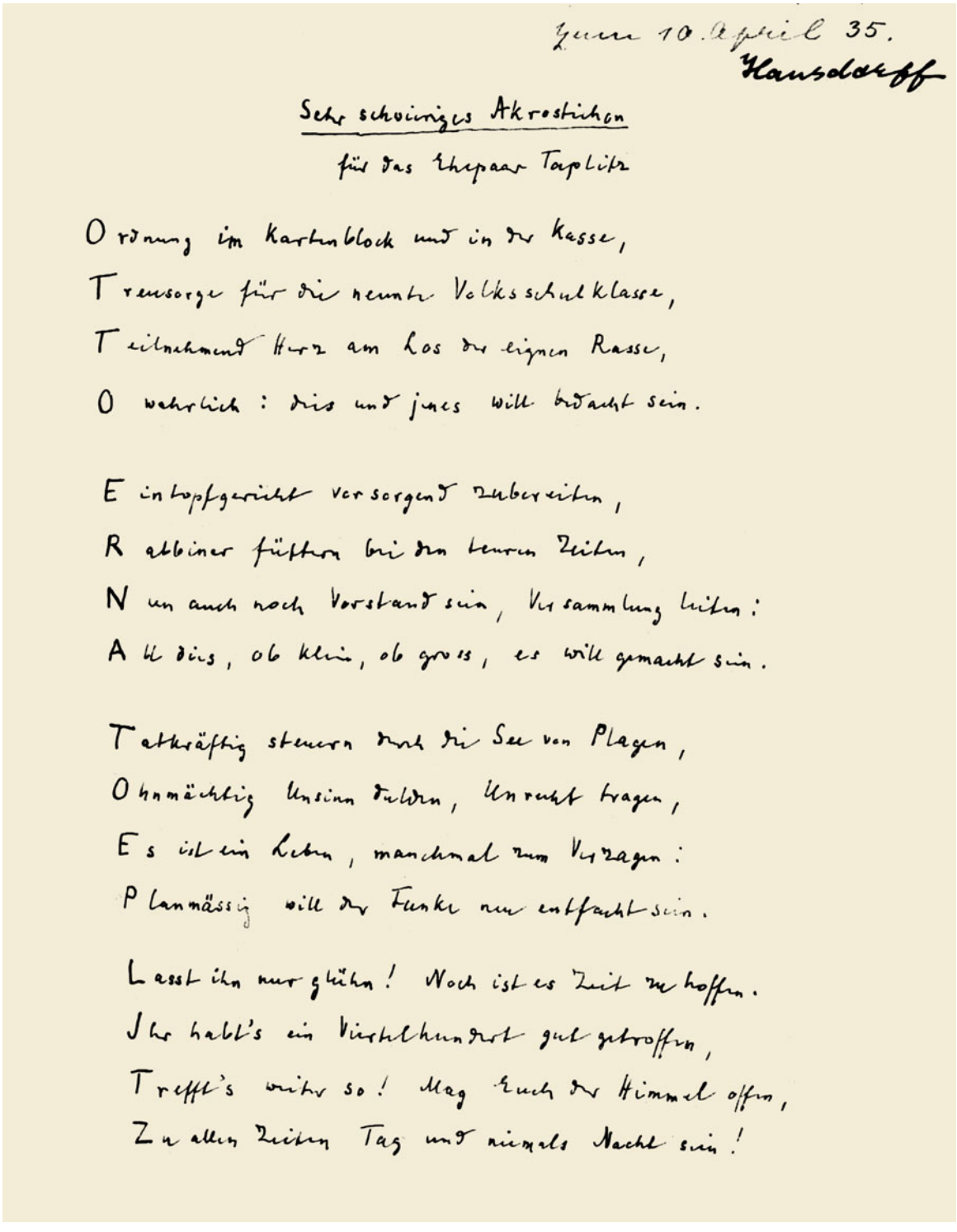
Extremely difficult acrostic
For Mr. and Mrs. Toeplitz

O orderly maps and orderly coffers
T a caring heart for his ninth-graders
T sympathetic to his race's lot
O oh, truly: everything requires his thought

E a hearty stew prepared with providence
R rabbis fed in costly times
N now a board member, chairing meetings
A all this needs doing, large or small

T energetically steering through a sea of plagues
O helplessly suffering nonsense and wrong
E this life may often be disheartening
P the spark re-ignited again and again

L let it glow! There is still time to hope
I for quarter of a century you've been blessed
T may this go on! May the sky be your limit
Z and always be it day and never night



Bonn 10. April 35.
Hausdorff

Sehr schwieriges Akrostichon
für das Ehepaar Toeplitz

Ordnung im Kartenblock und in der Kasse,
Treusorge für die neunte Volksschulklasse,
Teilnehmend Herz am Los der eignen Rasse,
O wahrlich: dies und jenes will bedacht sein.

Ein topfgericht versorgend zubereiten,
Rat beiner fürsten bei den teuren Zeiten,
Nun auch noch Vorstand sein, Versammlung leiten:
All dies, ob klein, ob gross, es will gemacht sein.

Tatkräftig steuern durch die See von Plagen,
Ohnmächtig Unsinn dulden, Unrecht tragen,
Es ist ein Leben, manchmal zum Verzagen:
Planmässig will der Funke neu entfacht sein.

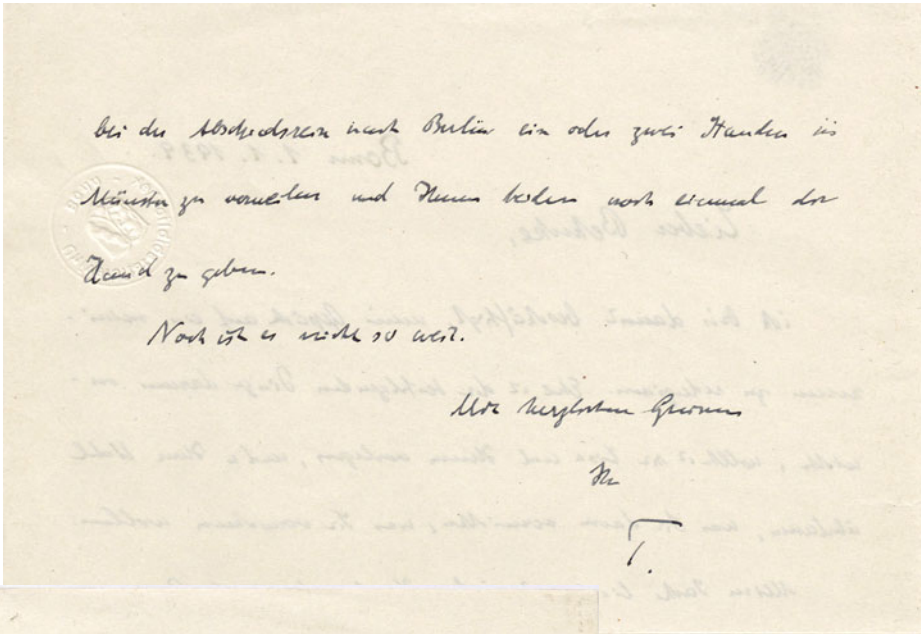
Lasst ihn nur glühen! Noch ist es Zeit zu hoffen.
Ihr habt's ein Viertelhundert gut getroffen,
Trefft's weiter so! Mag euch der Himmel offen,
Zu allen Zeiten Tag und niemals Nacht sein!

Felix Hausdorff's "very difficult acrostic" for Otto and Erna Toeplitz on the occasion of their 25th wedding anniversary on 10 April 1935

As a result of increasing emigration, pupil numbers at the school decreased significantly around 1937. In June 1941, the school was moved to the collecting center for Bonn Jews at the cloister Zur Ewigen Anbetung. Of the children who went to school there, only one survived the Holocaust.

On the basis of the Nuremberg Laws, Otto Toeplitz was dismissed without a word of thanks at the end of 1935. In 1939 he managed to emigrate to Palestine, where he was active in establishing the higher education system until his early death in 1940.

Letter from Otto Toeplitz to his friend and colleague Heinrich Behnke in Münster before his emigration to Palestine, 1 January 1939



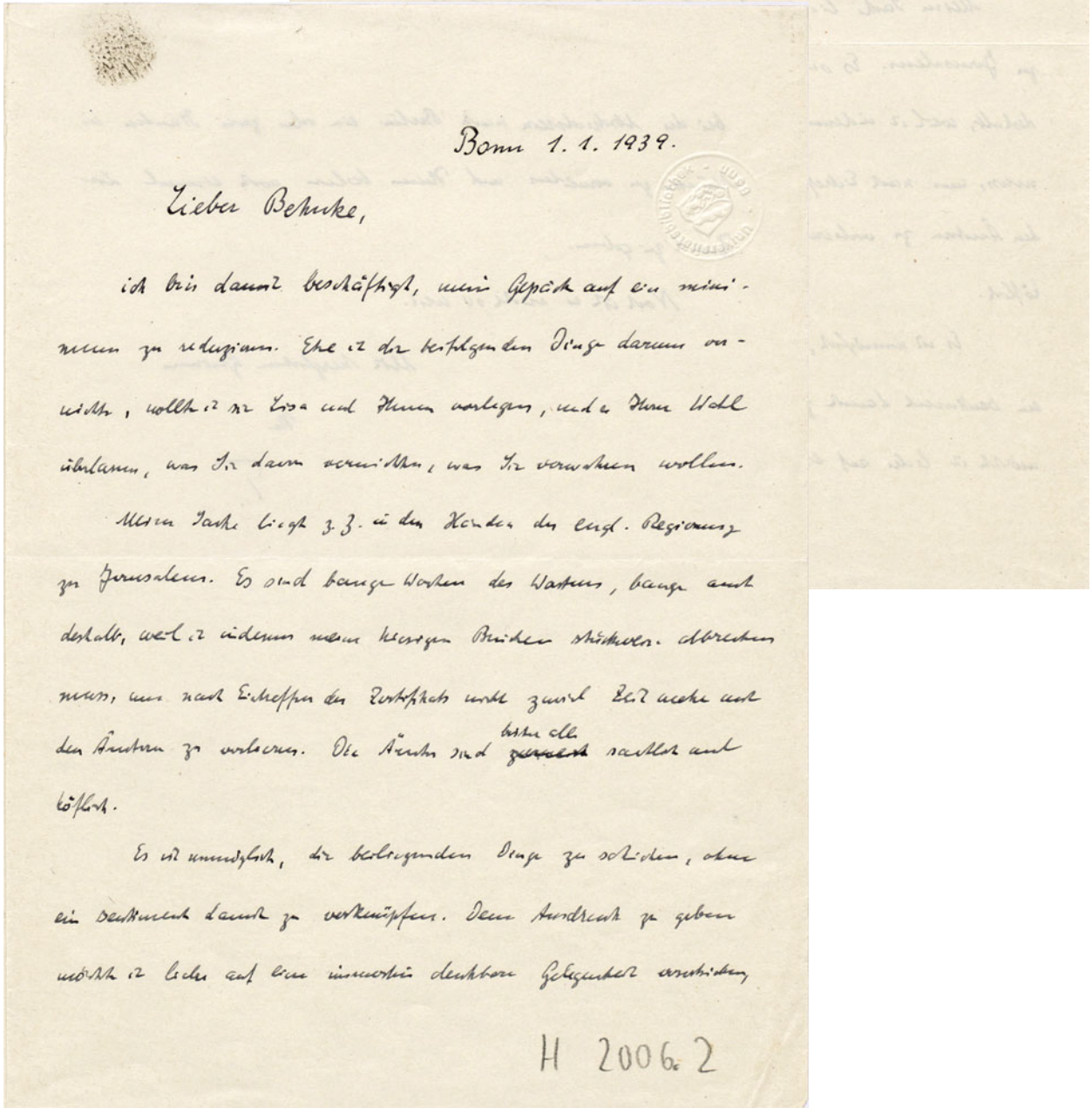
bei der Abreise nach Berlin ein oder zwei Stunden in Münster zu verbringen und Ihnen beiden noch einmal die Hand zu geben.

Noch ist es nicht so weit.

Mit herzlichen Grüssen

Ihr

O. T.



Bonn 1. 1. 1939.

Lieber Behnke,

ich bin damit beschäftigt, mein Gepäck auf ein minimum zu reduzieren. Ehe ich die restlichen Dinge darum ordne, wollte ich sie Lisa und Ihnen vorlegen, und Ihre Wahl überlassen, was Sie davon annehmen, was Sie verschenken wollen.

Meine Tante liegt z. Z. in den Händen der engl. Regierung zu Jerusalem. Es sind bange Wochen des Wartens, bange auch deshalb, weil ich wiederum meine besorgten Briefe abschicken muss, um nach Eintreffen des Certifikats noch zur Zeit meine und den Ämtern zu erscheinen. Die Ämter sind bisher alle sachlich und höflich.

Es ist unmöglich, die bedrängenden Dinge zu schildern, ohne ein bedrückend dunkle zu verknüpfen. Dem Ausdruck zu geben wäre ich leider auf eine immerhin denkbare Gelegenheit angewiesen

H 2006.2

Dear Behnke,

I am busy reducing my luggage to a minimum. Rather than destroy the enclosed things, I wanted to present them to you and Lisa and leave the choice up to you regarding what you destroy and what you preserve.

At the moment, my case is in the hands of the English government in Jerusalem. These are anxious days of waiting, anxious also because I must break off my local connections bit by bit in order not to lose too much time with government officials once the certificate arrives. The officials have thus far all been matter-of-fact and polite.

It is impossible to send the enclosed items without attaching an emotion to them. I would rather defer the expression of that emotion to an occasion when it will, I hope, be possible to spend an hour or two in Münster during the final journey to Berlin and once again shake hands with both of you.

But it is not yet time for that.

With best wishes,
Your T.

Otto Toeplitz's son, Erich (Uri), had already managed to flee to Palestine in 1936. He was a flautist and co-founder of the Israeli Symphony Orchestra. He dedicated his 1999 autobiography, *Und Worte reichen nicht: Von der Mathematik in Deutschland zur Musik in Israel*, to the memory of his father. In the foreword he writes of Jewish life, which has always been difficult:

"One had to be hard and stubborn, too, but the Toeplitzes were, beginning with my great-grandfather, as the reader will soon see. None of us had easy lives. My father, the most important among our ranks, suffered the most. He bore it like a hero, optimistic and active to the bitter end."[5]

Uri Toeplitz, front, left

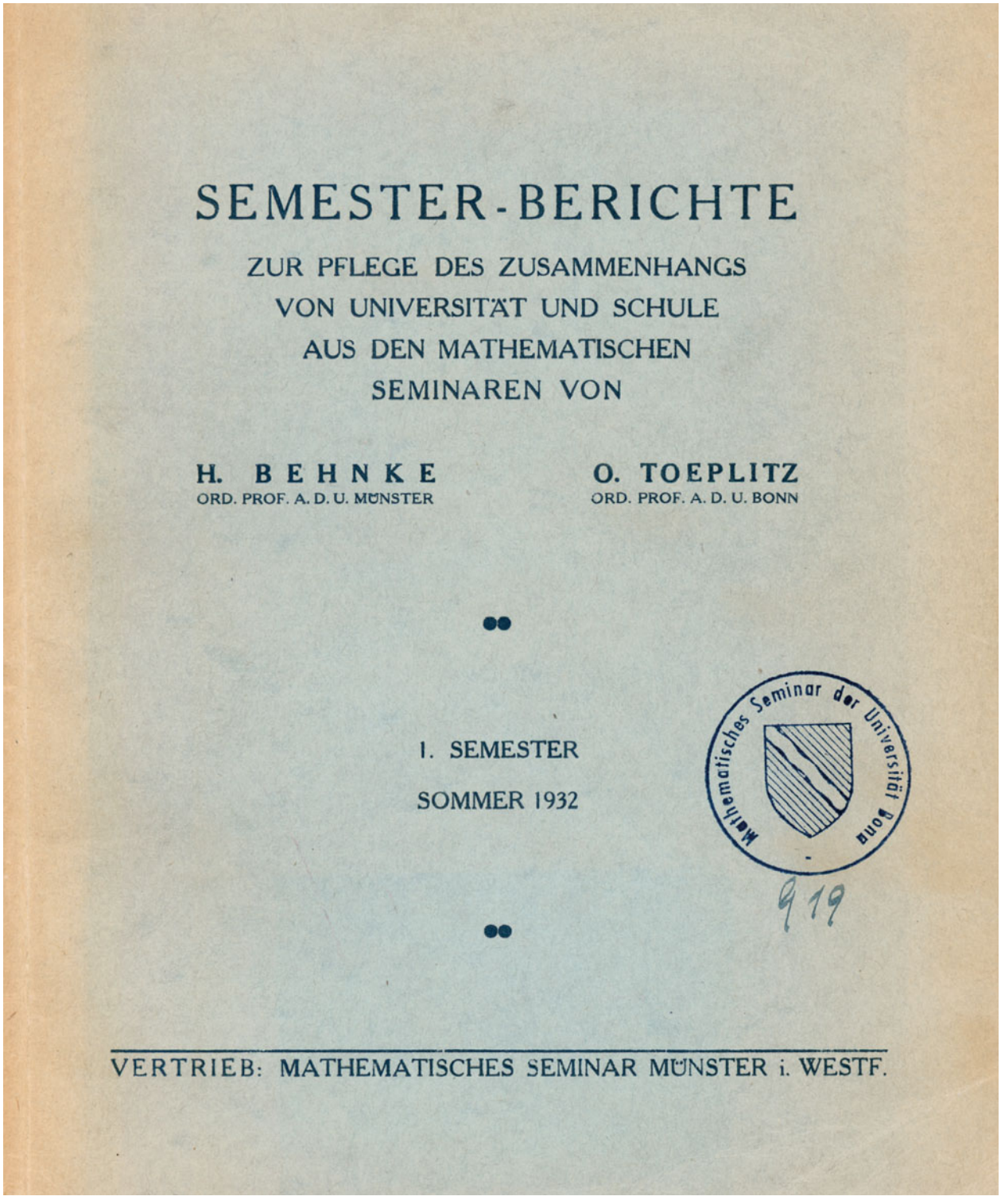
5 See (Toeplitz 1999: 7).

Among other things, Uri Toeplitz's book describes numerous meetings with famous musicians, which makes it an exciting read for music fans in particular. He also recounts his father's efforts at improving teaching in schools and universities.

"In 1923, Karl Jaspers wrote a book Die Idee der Universität, and dedicated it to my father. This demonstrates that even in Kiel father was no one-sided mathematician. Time and again he dealt with the issue of teaching mathematics in school. In 1928, he delivered a lecture 'On the tensions between the tasks and goals of mathematics at university and in higher education' at the 'Congress of German Naturalists and Physicians' in Hamburg. Early on in Kiel he had held colloquia for teachers on the didactics of mathematics, and it was from these that his collaboration with Heinrich Behnke in Münster later developed, as described in the hectographed journal Semesterberichte. He also did intensive work on the history of mathematics. He brought Julius Stenzel to Kiel and, together with philosopher Heinrich Scholz, they held seminars on Greek mathematics. He founded the journal Quellen und Studien zur Geschichte der Mathematik with Stenzel and Otto Neugebauer. At that time, he was also working on developing his 'genetic method'. This was his wholly original way of teaching the various sub-disciplines of mathematics at university. He presented them the way they had developed historically. As a result, he could replicate the excitement and joy of discovery and communicate them to the listeners."[6]

Walter Purkert

6 (Toeplitz 1999: 46f.).



SEMESTER-BERICHTE

ZUR PFLEGE DES ZUSAMMENHANGS
VON UNIVERSITÄT UND SCHULE
AUS DEN MATHEMATISCHEN
SEMINAREN VON

H. BEHNKE
ORD. PROF. A. D. U. MÜNSTER

O. TOEPLITZ
ORD. PROF. A. D. U. BONN

1. SEMESTER

SOMMER 1932

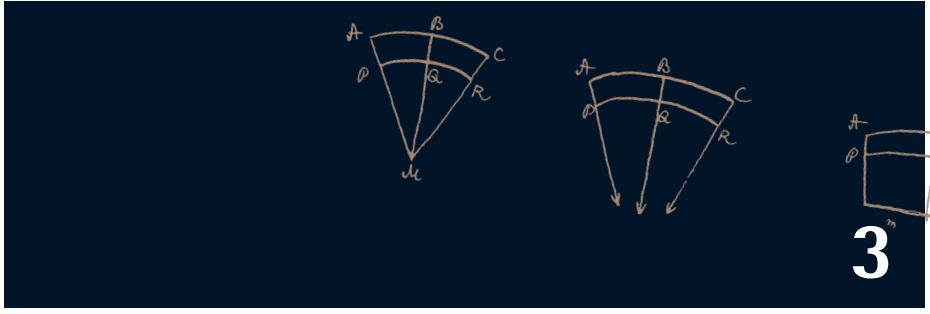
Mathematisches Seminar der Universität Bonn

919

VERTRIEB: MATHEMATISCHES SEMINAR MÜNSTER i. WESTF.

One of the first copies of *Mathematische Semesterberichte*; the journal still exists. Unfortunately, current issues no longer list the founders.

Lecture notes for the history of mathematics seminar at Frankfurt University



3

Frankfurt

During the Weimar years, the city of Frankfurt – characterized in the 19th century by a liberal middle class and home to an important Jewish community – blossomed into a center of German-Jewish intellectual life that was renowned even beyond the borders of Germany. In many branches of science, mathematics among them, innovative impulses originated in Frankfurt.

$$f(x) = f(x\sigma)\cdot\left(1-\frac{\lambda\sigma x}{1-\sigma x}\right)$$

$$= f(x\sigma^2)\cdot\left(1-\frac{\lambda\sigma x}{1-\sigma x}\right)\left(1-\frac{\lambda\sigma^2 x}{1-\sigma^2 x}\right) = \dots$$

$$f(x) = \prod_{n=1}^{\infty}\left(1-\frac{\lambda\sigma^n x}{1-\sigma^n x}\right) = \prod_{n=1}^{\infty}\left[1-(\lambda+1)\sigma^n x\right] : \prod_{n=1}^{\infty}(1-\sigma^n x)$$

B. Bergmann et al. (eds.), *Transcending Tradition*

The new university

Frankfurt University was founded in summer 1914 as an endowed university. A sizeable share of its endowment came from the city of Frankfurt and from influential Frankfurt citizens, including Jews like Wilhelm Merton (Metallgesellschaft) and Arthur von Weinberg (Cassella & Co., later IG Farben) as well as the foundation created by the banking family Georg and Franziska Speyer.

The statutes of the new university explicitly prohibited taking religion into account when making appointments. Moreover, female students were admitted from the start. In the liberal environment of Frankfurt after World War I, German-Jewish academic life flourished in most academic fields. Important scholars at Frankfurt University in the early years included medical researcher and Nobel Laureate Paul Ehrlich, physicists Friedrich Dessauer and Otto Stern, political economist Franz Oppenheimer, religious scholar Martin Buber, sociologist Karl Mannheim and philosopher Max Horkheimer – whose Institute for Social Research was the birthplace of the "Frankfurt School". In 1933, roughly one-third of all professors and lecturers at Frankfurt University were Jewish.

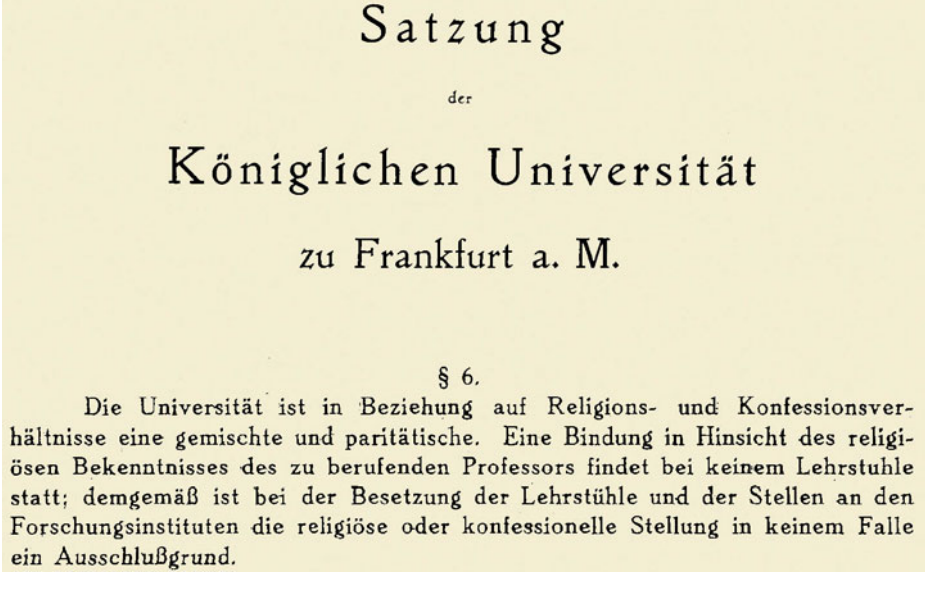
Cover of the deed of foundation for Frankfurt University

Arthur Schoenflies

Arthur Schoenflies

Arthur Schoenflies (1853-1928) became the first full professor at the mathematical institute of Frankfurt University. He had studied in Berlin (under Kummer, among others) and, following periods in Königsberg and Göttingen, where he had worked closely with Felix Klein, he became a professor at the *Akademie für Sozial- und Handelswissenschaften* in 1911. He played an important role in the establishment of the university and in the appointments of Ludwig Bieberbach and Max Dehn. He held several offices: he was the first dean of the faculty of natural sciences, for instance, and during the 1920-1921 academic year he was also president of the university.

Although Arthur Schoenflies's mathematically most productive time lay in the years before 1914, his interest in geometry, Cantorian set theory and topology (still called "analysis situs" at the time) provided an important background for mathematics at Frankfurt in the inter-war period. In Frankfurt, Schoenflies wrote two papers in which he used a group-theoretical analysis of crystal structures to determine the structures of diamonds, pyrite and other crystals, after Max von Laue, William Henry Bragg and others, beginning in 1912, had made it possible to analyze crystal structures with the aid of X-ray diffraction. Schoenflies's book *Krystallsysteme und Krystallstructur* [Crystal systems and crystal structure], published in 1891, can be considered his masterpiece.



Satzung

der

Königlichen Universität

zu Frankfurt a. M.

§ 6.

Die Universität ist in Beziehung auf Religions- und Konfessionsverhältnisse eine gemischte und paritätische. Eine Bindung in Hinsicht des religiösen Bekenntnisses des zu berufenden Professors findet bei keinem Lehrstuhle statt; demgemäß ist bei der Besetzung der Lehrstühle und der Stellen an den Forschungsinstituten die religiöse oder konfessionelle Stellung in keinem Falle ein Ausschlußgrund.

Excerpt from Frankfurt University statutes pertaining to religious freedom

XXXI. Über Krystallstruktur.

Von

A. Schoenflies in Frankfurt a. M.

(Mit 16 Textfiguren.)

Durch die höchst eigenartigen Strukturen, die die Herren W. H. Bragg und W. L. Bragg für einzelne Krystalle unlängst angegeben haben, ist die allgemeine Strukturtheorie der Krystallsubstanz erneut in den Vordergrund des Interesses getreten. Ich folge einer freundlichen Aufforderung des Herausgebers dieser Zeitschrift, des Herrn P. Groth, wenn ich an dieser Stelle eine anschauliche Erörterung der Frage gebe, wie sich die neueren Auffassungen in den Rahmen der von mathematischer Seite aufgestellten Theorien einordnen, und was diese Theorien praktisch für die Auffindung passender Strukturen leisten können.

Nach der Groth'schen Auffassung besteht der Übergang aus dem Lösungszustand in den krystallinischen molekulartheoretisch bekanntlich darin, daß die chemische Molekel bei diesem Übergang ganz oder doch teilweise ihren Zusammenhang verliert, und daß man daher die chemischen Atome als die eigentlichen individuellen Bausteine der Krystallsubstanz anzusehen hat[1]). Sie sind es, die in regelmäßiger Anordnung im Raum verteilt sind. Genauer besteht danach jede Krystallsubstanz in der Weise aus einer endlichen Zahl regelmäßiger Punktsysteme, daß jedes dieser konstituierenden Punktsysteme von lauter chemisch und strukturell gleichwertigen Atomen gebildet wird. Diese Auffassung ist es, die in jüngster Zeit durch die obengenannten Bragg'schen Strukturen eine glänzende Bestätigung erfahren hat, und deren Einordnung in die allgemeine mathematische Theorie hier erörtert werden soll. Auch bedarf der früher von mir benutzte wesentlich geometrische Begriff der konstituierenden Krystallmolekel der Anpassung an die Groth'sche Auffassung; sachliche Änderungen werden dadurch freilich nicht bedingt. Daneben wird es sich noch

1) Vgl. diese Zeitschrift 1914, **14**, 67, wo sich die genauere Literatur angegeben findet.

Arthur Schoenflies, "Über Krystallstruktur" [On crystal structures], in: *Zeitschrift für Krystallographie* 54 (1915), pp. 545–69

darum handeln, einen Einwand zu beseitigen, den Herr Groth infolge mißverständlicher Deutung eines Resultates der mathematischen Theorie gegen sie erhoben hat. Die Konsequenzen, die Herr Groth dieser mathematischen Theorie entnommen hat, würden allerdings im Gegensatz zu den mineralogischen Tatsachen stehen und würden ihr deshalb die praktische Bedeutung rauben[1]; sie lassen sich aber nicht aus ihr folgern (§ 4).

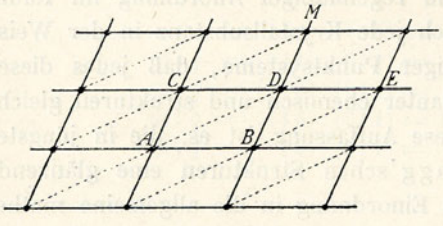
Meine Darstellung wird in zwei Teile zerfallen. Der erste, der hier folgt, behandelt die einfacheren, der Anschauung unmittelbar zugänglichen Fälle; es sind zugleich diejenigen, in denen ein sachliches Hinausgehen über die geläufigen Vorstellungen meist nicht nötig ist. Nur die Begriffswelt, in der die allgemeine mathematische Theorie operiert, ist eine andere. Ihre Eigenart besteht wesentlich darin, daß sie diejenigen Grundbegriffe, von denen die geometrischen Resultate tatsächlich abhängen, auch bei der Ableitung dieser Resultate in den Vordergrund rückt. Es sind dies die zwei Begriffe Gruppe und Fundamentalbereich. Überdies wird auch die Erfassung und Beherrschung der bezüglichen geometrischen Tatsachen durch sie erheblich erleichtert. Insbesondere würden die allgemeineren Strukturen, die im später folgenden Teil zu behandeln sind, ohne Benutzung dieser Begriffe nur schwer auffaßbar bleiben.

§ 1. Der Fundamentalbereich der Netze und Raumgitter.

Die Eigenschaften des Fundamentalbereichs, auf die es hier ankommt, sind teils äußere, gestaltliche, teils innere. Ich will sie zunächst für den einfachsten Fall der regelmäßigen Punktsysteme, nämlich für die ebenen Netze und die Raumgitter, darlegen.

Das in Fig. 1 gezeichnete (unbegrenzt zu denkende) Netz kann auf mannigfache Weise so in sich übergeführt werden, daß jeder Netzpunkt wieder in einen Netzpunkt fällt.

Fig. 1.



Einfachste Bewegungen, die dies leisten, sind die Schiebungen, die nach Länge und Richtung durch die Parallelogrammseiten AB und AC dargestellt werden. In der Tat geht durch sie jeder Netzpunkt wieder in einen Netzpunkt über; insbesondere gelangt im ersten Fall A nach B, im zweiten A nach C. Ist ferner M irgend ein anderer Netzpunkt, so bringt auch die Schiebung, die A nach M führt, das ganze Netz mit sich zur Deckung. Die Gesamtheit aller dieser Deckschiebungen heißt auch die dem Netz zukommende Gruppe von Deckschiebungen.

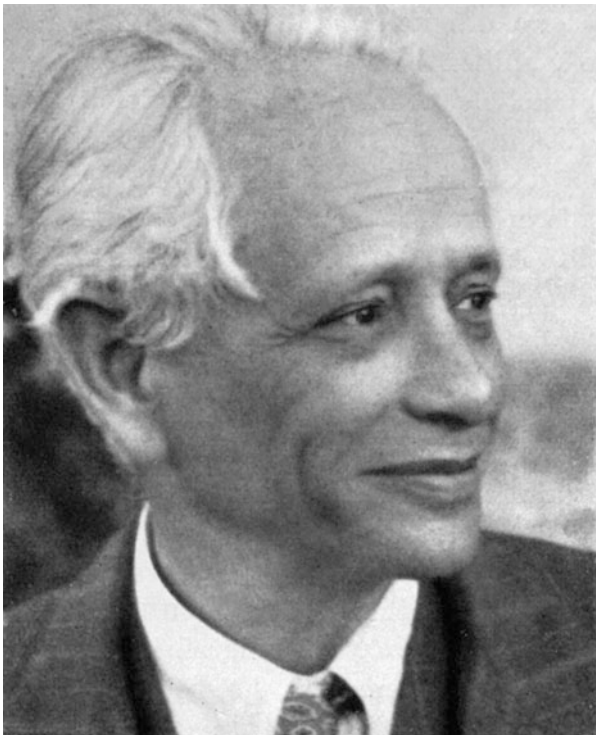
1) Vgl. diese Zeitschrift 1914, **54**, 66, sowie auch 498, Anmerk.

The Frankfurt mathematics institute

The Frankfurt mathematics institute grew rapidly.[1] From 1914 onwards, Ernst Hellinger held the post of Extraordinarius, and in 1915 Ludwig Bieberbach was appointed second full professor. Following Bieberbach's move to Berlin in 1921, the position was given to Max Dehn. In the same year, two more Extraordinarius posts were created, for Otto Szász and Paul Epstein. Carl Ludwig Siegel succeeded Schoenflies in 1922. All of these mathematicians, except for Bieberbach and Siegel, were Jewish.

Max Dehn

Max Dehn (1878-1951), a brilliant doctoral student of David Hilbert, earned his doctorate in 1899. After a longer period as Privatdozent in Münster, he became Extraordinarius in Kiel in 1911. From 1913 to 1921 he was full professor in Breslau and later in Frankfurt. Dehn, who had begun his mathematical research by working on geometry under Hilbert, turned to topology after 1906. Together with the Danish mathematician Poul Heegaard, he wrote a detailed article on "Analysis Situs" for *Enzyklopädie der mathematischen Wissenschaften* [Encyclopedia of mathematical sciences] summarizing what was known at the time on the topology of surfaces. He then turned to three-dimensional topology. After initially trying to solve the Poincaré conjecture (without success), he studied knots and knot groups. His construction of "Poincaré spaces" – i.e. three-dimensional manifolds with trivial homology – from knot complements was influential. Dehn's construction technique, further developed into so-called "Dehn surgery", forms a central tool in the topology of three-dimensional manifolds. Among other subjects, Dehn's later mathematical work focused on mapping class groups of surfaces and problems of combinatorial group theory.



Max Dehn

In 1935, Max Dehn was forced into early retirement. After the "Reichskristallnacht" of 1938, he left Germany with his wife Antonie (née Landau) in 1939, fleeing to Norway by way of Denmark. A second escape from the Nazis led the couple through Sweden, Finland, Russia and Japan to the United States.[2] Dehn's last position was at Black Mountain College in North Carolina, an experimental and progressive institution whose faculty also included immigrant artists. After World War II, the college attracted a new generation of young avant-garde artists of all fields, from painting to music and dance. Ornaments and rhythms – for Dehn these two were an expression of "the mathematical ability in humans".[3]

1 See (Siegel 1964) and (Schwarz 2005).

2 Dehn's escape – like the events in the lives of other Frankfurt mathematicians after 1933 – is described dramatically by (Siegel 1964).

3 See (Dehn 1940). This essay [On ornamentation] was written during his Norwegian exile. On Dehn's "The mathematical ability in humans" see also the essay "Mathematics in Culture" in this volume.

Alle Poincareschen Räume, die zur Kleeblattschlinge gehören, haben, mit Ausnahme der oben untersuchten und des gewöhnlichen Raumes, unendliche Gruppen, deren Bilder durch reguläre Polygoneinteilung der Nicht-Euklidischen Ebene, bei der je drei $(6n-1)$-Ecke $(n>1)$ in einem Punkte zusammenstoßen, erzeugt werden.

Um die Bedeutung des Gruppenbildes stärker hervortreten zu lassen, sei bemerkt, daß jeder geschlossenen Kurve auf dem Bild eine Substitution entspricht, die $=1$ ist, und eine Kurve der Mannigfaltigkeit, die auf Null zusammenziehbar ist, d. i. ein einfach zusammenhängendes Flächenstück begrenzt. Die Aufstellung des obigen Gruppenbildes hilft nicht nur zum Beweis, daß die Raumkurven verknotet oder die Räume dem gewöhnlichen nicht homöomorph sind, sondern *es wird dadurch auch die Aufgabe gelöst, von jeder gegebenen Kurve des Außenraums, bezw. der verschiedenen Poincaréschen Räume, in einer endlichen Anzahl von Schritten zu entscheiden, ob sie auf Null zusammenziehbar ist oder nicht.*

b) *Andere Knoten.* Hier soll nur eine Gruppe von ganz besonders einfachen Knoten behandelt werden, die eng mit der Kleeblattschlinge verwandt sind. Die ersten beiden Glieder sind in den nebenstehenden Figuren 14, 15 angedeutet, die anderen werden analog fortschreitend erhalten. Sie haben $5, 7, \cdots, 3+2n$ Kreuzungspunkte und gehen durch

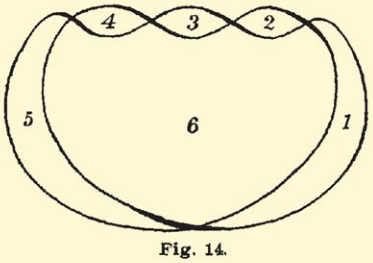


Fig. 14.

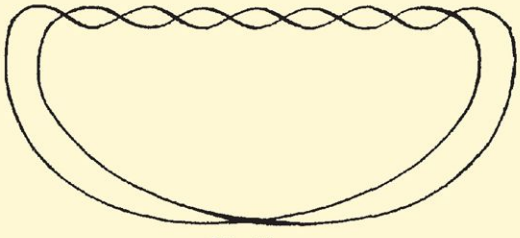


Fig. 15.

$1, 2, \cdots, n$ Umschaltungen an den Kreuzungspunkten in die Kleeblattschlinge über. Man erkennt nach der im vorigen Paragraphen gegebenen Regel leicht, daß für $n=1$ die Gruppe gegeben ist durch

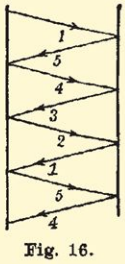


Fig. 16.

$$\begin{cases} \text{Erzeugende Operationen: } C_1,\ C_2,\ C_3,\ C_4,\ C_5,\ C_6. \\ \text{Relationen: } \begin{cases} C_1 C_6^{-1} C_2 = C_2 C_6^{-1} C_3 = C_3 C_6^{-1} C_4 \\ = C_4 C_6^{-1} C_5 = C_5 C_6^{-1} C_1 = 1. \end{cases} \end{cases}$$

Das Gruppenbild setzt sich aus ähnlichen Streifen zusammen, wie bei der Kleeblattschlinge (s. Fig. 16), je fünf Streifen stoßen an einer C_6-Kette zusammen. — Ähnliches gilt für $n>1$. — Fügen wir im Falle $n=1$ zu den Relationen die neue Relation

$$C_1 C_4 C_2 C_5 C_3 C_2^{-4} = 1$$

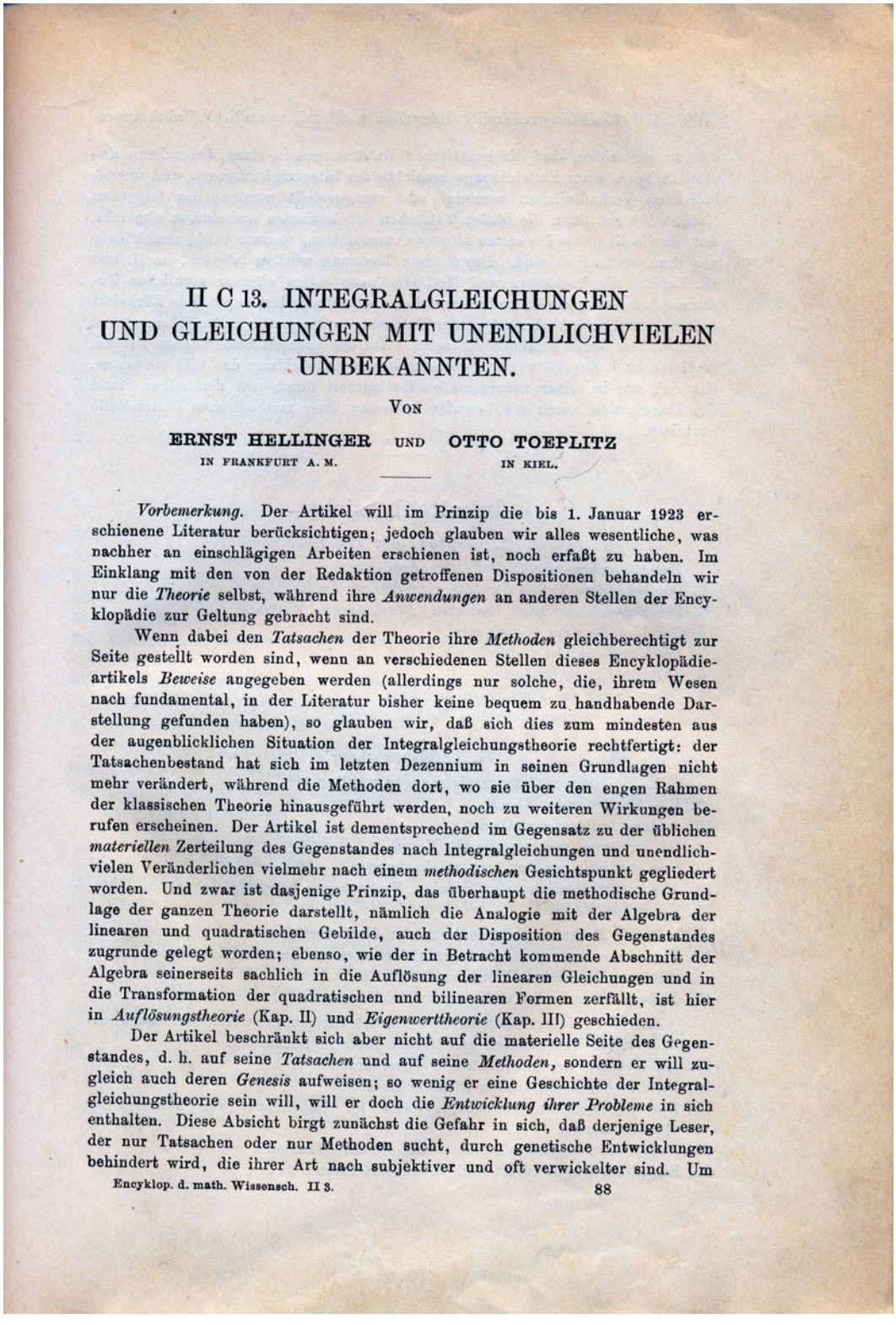
Max Dehn, "Über die Topologie des dreidimensionalen Raumes" [On the topology of three-dimensional spaces], in: *Mathematische Annalen* 69 (1910), pp. 137–68. In this paper Dehn discusses "Poincaré spaces", i.e. three-dimensional manifolds with trivial homology, constructed from the complement of the trefoil knot and certain other knots. In order to show that these manifolds are different from "ordinary space", Dehn constructs the "Gruppenbild" (or Cayley graph) of their fundamental groups. Dehn's paper was an offshoot of a failed attempt to solve the three-dimensional Poincaré conjecture.

Ernst Hellinger

Ernst Hellinger (1883-1950) was another of Hilbert's doctoral students before he obtained his habilitation from Marburg University in 1909 and became Privatdozent. He came to Frankfurt in 1914. In Göttingen, Hellinger had already worked primarily on integral equations and on questions that had developed from this work. The article he wrote with Otto Toeplitz, "Integralgleichungen und Gleichungen mit unendlich vielen Unbekannten" [Integral equations and equations with an infinite number of unknowns], published in *Enzyklopädie der Mathematischen Wissenschaften* in 1927, summarized what was then known in this area, including an account of new methods of functional analysis.

Ernst Hellinger

In 1935, Hellinger was forced to retire from his position. In 1938 he was arrested and sent to the Dachau concentration camp. His release after six weeks and his emigration to the USA were made possible only through the intervention of his sister, who had already emigrated. In his final years, Hellinger taught at the Illinois Institute of Technology in Chicago. For him, there was no longer any question of returning to Germany.



II C 13. INTEGRALGLEICHUNGEN UND GLEICHUNGEN MIT UNENDLICHVIELEN UNBEKANNTEN.

Von

ERNST HELLINGER IN FRANKFURT A. M. UND OTTO TOEPLITZ IN KIEL.

Vorbemerkung. Der Artikel will im Prinzip die bis 1. Januar 1923 erschienene Literatur berücksichtigen; jedoch glauben wir alles wesentliche, was nachher an einschlägigen Arbeiten erschienen ist, noch erfaßt zu haben. Im Einklang mit den von der Redaktion getroffenen Dispositionen behandeln wir nur die *Theorie* selbst, während ihre *Anwendungen* an anderen Stellen der Encyklopädie zur Geltung gebracht sind.

Wenn dabei den *Tatsachen* der Theorie ihre *Methoden* gleichberechtigt zur Seite gestellt worden sind, wenn an verschiedenen Stellen dieses Encyklopädieartikels *Beweise* angegeben werden (allerdings nur solche, die, ihrem Wesen nach fundamental, in der Literatur bisher keine bequem zu handhabende Darstellung gefunden haben), so glauben wir, daß sich dies zum mindesten aus der augenblicklichen Situation der Integralgleichungstheorie rechtfertigt: der Tatsachenbestand hat sich im letzten Dezennium in seinen Grundlagen nicht mehr verändert, während die Methoden dort, wo sie über den engen Rahmen der klassischen Theorie hinausgeführt werden, noch zu weiteren Wirkungen berufen erscheinen. Der Artikel ist dementsprechend im Gegensatz zu der üblichen *materiellen* Zerteilung des Gegenstandes nach Integralgleichungen und unendlichvielen Veränderlichen vielmehr nach einem *methodischen* Gesichtspunkt gegliedert worden. Und zwar ist dasjenige Prinzip, das überhaupt die methodische Grundlage der ganzen Theorie darstellt, nämlich die Analogie mit der Algebra der linearen und quadratischen Gebilde, auch der Disposition des Gegenstandes zugrunde gelegt worden; ebenso, wie der in Betracht kommende Abschnitt der Algebra seinerseits sachlich in die Auflösung der linearen Gleichungen und in die Transformation der quadratischen und bilinearen Formen zerfällt, ist hier in *Auflösungstheorie* (Kap. II) und *Eigenwerttheorie* (Kap. III) geschieden.

Der Artikel beschränkt sich aber nicht auf die materielle Seite des Gegenstandes, d. h. auf seine *Tatsachen* und auf seine *Methoden*, sondern er will zugleich auch deren *Genesis* aufweisen; so wenig er eine Geschichte der Integralgleichungstheorie sein will, will er doch die *Entwicklung ihrer Probleme* in sich enthalten. Diese Absicht birgt zunächst die Gefahr in sich, daß derjenige Leser, der nur Tatsachen oder nur Methoden sucht, durch genetische Entwicklungen behindert wird, die ihrer Art nach subjektiver und oft verwickelter sind. Um

Ernst Hellinger and Otto Toeplitz, "Integralgleichungen und Gleichungen mit unendlichvielen Unbekannten" [Integral equations and equations with an infinite number of unknowns], in: *Enzyklopädie der mathematischen Wissenschaften*, Vol. II, Leipzig 1927. The article, summarizing recent work on integral equations and the spectral theory of infinite matrices (in particular, those later called "Toeplitz operators"), played an important role in the development of functional analysis.

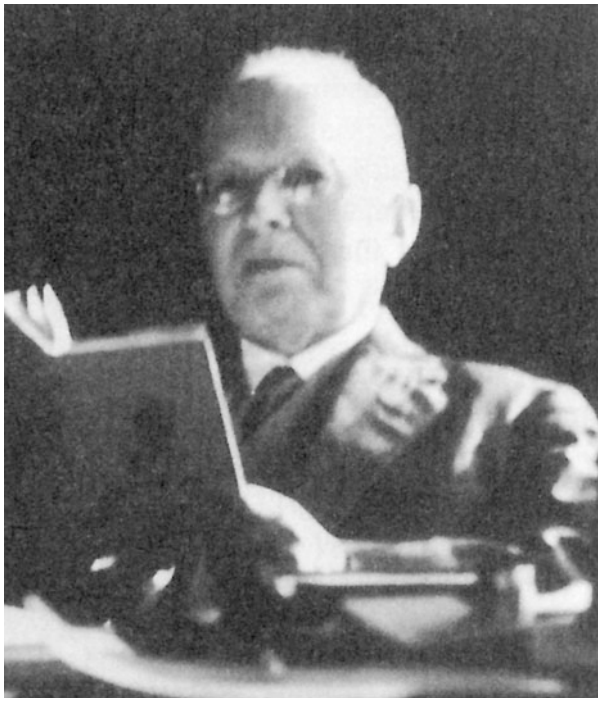
dies zu vermeiden, sind die genetischen Erörterungen in einem besonderen Kapitel in Form einer Entwicklungsgeschichte der Integralgleichungen und unendlichvielen Veränderlichen vereinigt und vorangestellt worden; die folgenden Kapitel bringen dann die bloßen Tatsachen und Methoden und sind so abgefaßt, daß sie die Kenntnis des ersten nirgends voraussetzen, sondern völlig unabhängig von ihm verständlich sind. Durch diese Trennung wird es möglich, im II. und III. Kapitel die Tatsachen und Methoden nach ihrem eigenen sachlichen Zusammenhang anzuordnen und darzustellen und unbehindert durch jede Rücksicht auf die historische Verknüpfung der Tatbestände die methodischen Elemente zu ihrem vollen Recht gelangen zu lassen. Auf der anderen Seite können wir um so freier im I. Kapitel von der geschichtlichen Entwicklung das Bild entwerfen, das sich uns in seiner naturgemäßen Bedingtheit durch den derzeitigen Stand der Theorie und durch die bewußte Betonung ihrer methodischen Bestandteile darbietet.

Inhaltsübersicht.

Paul Epstein

Paul Epstein (1871-1939) came to Frankfurt from Strasbourg, where he had been a Privatdozent from 1903 to 1918. He became Extraordinarius in 1921. In his dissertation Epstein analyzed, on the basis of works by Karl Weierstrass and others, certain properties of hyperelliptic integrals. Later on he turned to number theory and proposed a generalization of the Riemann zeta function depending on a given quadratic form. Epstein proved a functional equation, the analytic continuation and the Kronecker limit formula for these later so-called Epstein zeta functions.

On 11 August 1939, Paul Epstein committed suicide at his home in Frankfurt in order to avoid arrest by the Gestapo.

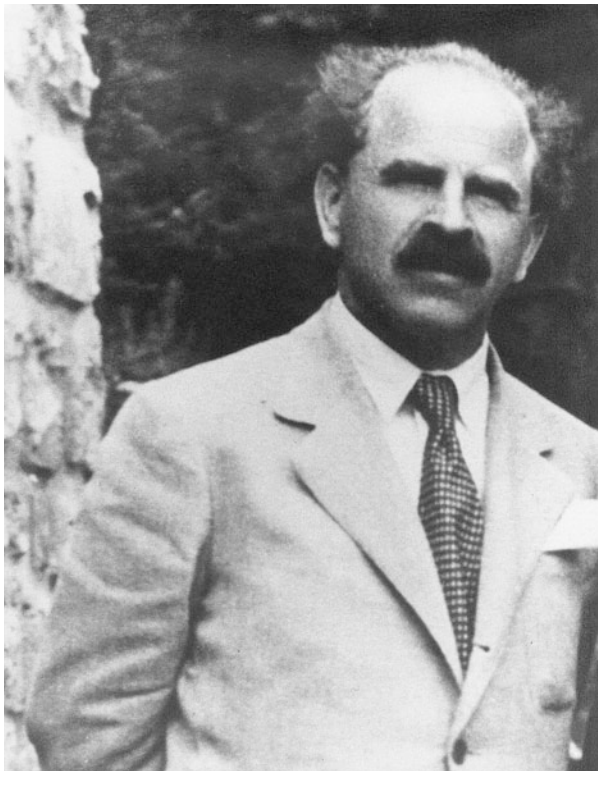


Paul Epstein

Otto Szász

Otto Szász (1884-1952) studied and received his doctorate in Budapest. He also spent a year, 1908, studying in Göttingen. Szász obtained his habilitation from Frankfurt University in 1914 and was appointed Extraordinarius in 1921. During his time in Frankfurt, he worked primarily on topics and methods of real analysis, among other things on theories of Fourier series, power series and continued fractions.

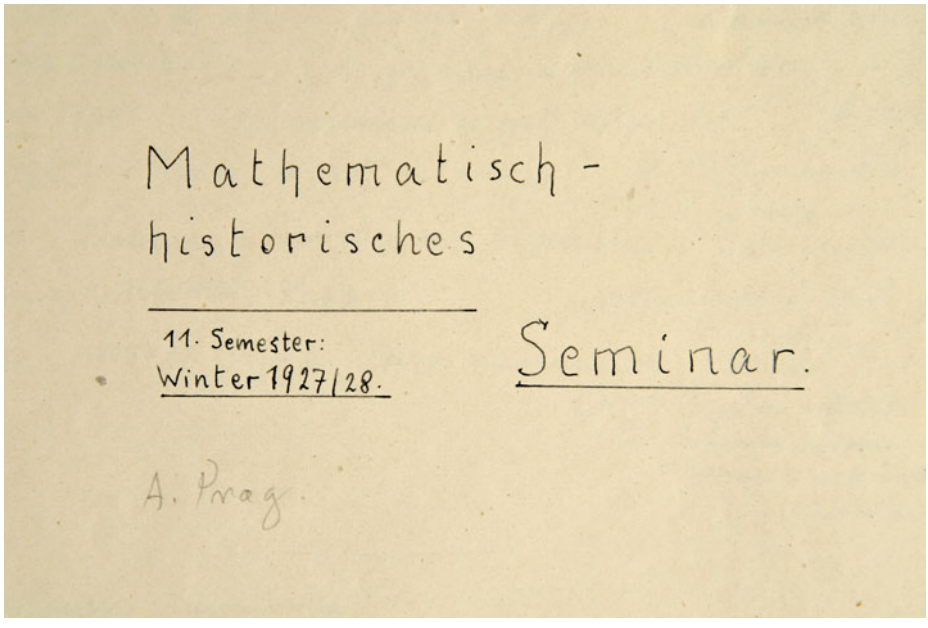
Szász was banned from teaching in 1933. He then emigrated to the USA where, after receiving several fellowships, he became a professor at the University of Cincinnati.



Otto Szász

Like Frankfurt University itself, the institute of mathematics experienced a remarkable intellectual flourishing in the Weimar years, which left a deep impression on guests such as Otto Toeplitz, who made regular visits from Bonn, or André Weil, who repeatedly traveled there from France. This productive period ended abruptly in 1933. All Jewish lecturers lost their jobs and suddenly found themselves unemployable. The family of the "father" of the institute, Arthur Schoenflies, was also hit hard: his five children were all victims of the Nazi regime. Grandchildren of his brother George also died, among them the writer and philosopher Walter Benjamin, who committed suicide at the Spanish border in 1940 while fleeing from the Germans.

The history of mathematics seminar



Cover sheet of Adolf Prag's notes on the history of mathematics seminar

Max Dehn with two students

A unique achievement in Frankfurt was the history of mathematics seminar, in which at least between 1925 and 1931 (but possibly longer) Frankfurt lecturers and professors met regularly with advanced students to discuss ancient and early modern mathematical texts. Working together in this way on the history of mathematics was unusual, and the seminar left a strong impression on its participants. Max Dehn was considered the organizer of the history of mathematics seminar. Paul Epstein, who had received a salaried teaching assignment for didactics and history of mathematics in the winter 1923-1924, also played an important role.[4]

In his autobiography, André Weil (1906-1998) later described the history of mathematics seminar, which he attended as a young student:

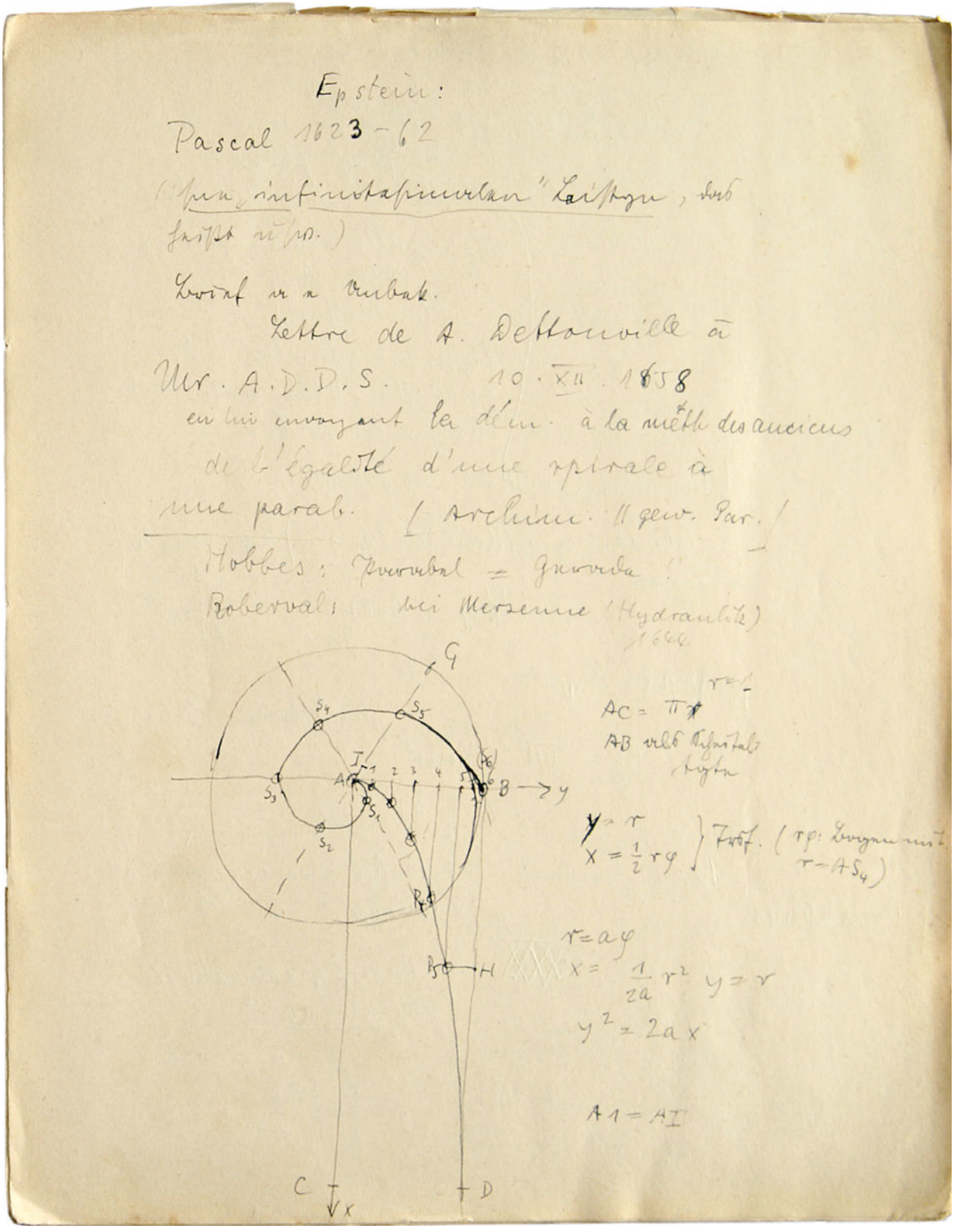
"A humanistic mathematician who saw mathematics as one chapter – certainly not the least important – in the history of human thought, Dehn could not fail to make an original contribution to the historical study of mathematics, and to involve his colleagues and students in this project. This contribution, or rather this creation, was the historical seminar of the Frankfurt mathematics institute. Nothing could have seemed simpler or less pretentious. A text would be chosen and read in the original, with an effort to follow closely not only the superficial lines but also the thrust of the underlying ideas. [....] It was only later that I attended it, on subsequent visits to Frankfurt, a place I made a point of visiting as often as I could. I am not sure whether it was already in the summer semester of 1926 that, during

4 On Epstein's understanding of the cultural significance of mathematics, see the essay "Mathematics in culture" in this volume.

a seminar session devoted to Cavalieri, Dehn showed how this text had to be read from the viewpoint of the author, taking into account both what was commonly accepted in his lifetime and the new ideas that Cavalieri was trying to the best of his ability to implement. Everyone participated in the discussion, contributing what he could to the group effort."[5]

5 (Weil 1992: 52).

A page from the lecture notes for one of Epstein's lectures on Pascal



André Weil

The list of topics discussed in the history of mathematics seminar reads like an attempt to counter Oswald Spengler and other cultural critics by demonstrating the continuous development of mathematics through a detailed study of sources, especially in the fields of algebra and analysis. Otto Toeplitz in particular, a regular guest at the seminar, expressed this concern in his 1926 essay "Mathematik und Antike" [Mathematics and antiquity]. This conviction is also reflected in his monograph, *Die Entwicklung der Infinitesimalrechnung* [The development of infinitesimal calculus], which was published posthumously by Gottfried Köthe in 1949 as volume 56 of the "Yellow Series".

For Max Dehn, too, the history of mathematics was connected with more sweeping issues and, following his forced retirement in 1935, he wrote several challenging studies on ancient mathematics, in which he explored the connection between mathematics and philosophical thought. Among these works are "Raum, Zeit und Zahl bei Aristoteles, vom mathematischen Standpunkt aus" [Space, time and number in Aristotle from a mathematical perspective] from 1936 and "Beziehungen zwischen der Philosophie und der Grundlegung der Mathematik im Altertum" [Relationships between philosophy and the foundation of mathematics in antiquity] in 1937.

The notes for the history of mathematics seminar, which no longer took place after 1933, made their way back to the Frankfurt University archives a few years ago. Adolf Prag, who was a student in Frankfurt at the time and later married a daughter of art historian Aby Warburg in Great Britain, preserved them in his exile. Max Dehn's interest in the history of mathematics remained strong even after his expulsion from Germany. His first publications in the USA were articles providing historical overviews of mathematics in the ancient world as well as an essay on James Gregory, co-authored with Ernst Hellinger.

Moritz Epple

Notebook I: summer 1925 – summer 1926, Development of Algebra. Note-taker: Baecker. Comprises ca. 120 pages.
Euclid, Hero, Aryabhata, Al Biruni, Abraham ben Meir ibn Esra, Maumet, Leonardo Pisano, Nicolas Chuquet, Gerolamo Cardano, Lodovico Ferrari, Franciscus Vieta

Notebook II [winter 1926/1927?]. Note-taker: Berlinger
Bombelli

Notebook III: begun 12 May 1927 ("10th semester"). Note-taker: unknown
Extremal problems in Kepler's *Stereometria Doliorum*

Notebook IV: [Summer 1927?]. Note-taker: Max Feuchtwanger (stud. phil.), Berlin N 24
Bonaventura Cavalieri

Notebook V: winter 1927/1928 ("11th semester"). Note-taker: Adolf Prag,
Lecturers: Maier, Schmitt, Epstein, Prag
Wallis, Torricelli, Fermat, Descartes, Roberval, Wren, Neil, Jacob Bernoulli

Notebook VI: summer 1928. Lecturers: Epstein, Dr. Ickes
Pascal, central issues of infinitesimals; Barrow, Lectiones mathematicae; Borelli, *Euclides restitutus*

Notebook VII: winter 1928/1929. Lecturers: Siegel et al.
Overview of Barrow's lectures on geometry from VIII to XIII

Notebook VIII: summer, winter 1928/1929. Note-taker: unknown
Barrow, *Lectiones geometricae*. Continued.

Notebook IX: winter 1928/1929. Note-taker: unknown, lecturer: Dr. Ickes
Newton, *De analysi per aequationes numero terminorum infinitas*

Notebook X: [winter 1929/1930?]. Note-taker: unknown
Newton, *Methodus fluxionum et serierum infinitarum cum eiusdem applicatione ad curvarum geometriam* [Methods of fluxions and infinite series, with its application to the geometry of curved lines)

Notebook XI: [winter 1929/1930?]. Note-taker: Otto Härtling
Newton, problems of tangential construction

Notebook XII [winter 1929/1930?]. Note-taker: Lohner
Problema V. in Newtons *Methodus fluxionem et serierum infinitarum* (with an overview by Epstein on related subjects in the works of Roberval, Huygens, Leibniz and Cantor)

Notebook XIII [winter 1929/1930?]. Note-taker: unknown
Newton, *Methodus fluxionem et serierum infinitarum*. Continued.

Notebook XIV: begins 1 May 1930. Note-taker: unknown
Newton, *Principia Mathematica*, planetary movement

Notebook XV: [summer 1930?]. Note-taker: Lohner
De l'Hospital, *Analyse des infiniment petits pour l'intelligence des lignes courbes*, Foreword

Notebook XVI : winter 1930/1931. Note-taker: Lohner
Leonhard Euler, *Introductio in analysis infinitorum, liber I*, Chapters 9, 10, 11

Table of contents of the notes of the history of mathematics seminar at Frankfurt University. In some cases, the notebooks which have survived comprise only a few pages, but most of them are around 30–40 pages. The seminar series may have begun even earlier than the summer semester of 1925.

RAUM, ZEIT, ZAHL BEI ARISTOTELES VOM MATHEMATISCHEN STANDPUNKT AUS

ERSTER TEIL

Aristoteles war kein produktiver Mathematiker und in allen seinen Werken wird man nur sehr wenige der reinen oder der angewandten Mathematik angehörende Einzeltatsachen finden. Aber er hat tiefe Betrachtungen angestellt über *Raum und Zeit als Kontinuen*, zunächst über ihre Eigenschaften «im Kleinen». Diese Ueberlegungen gehören der *Topologie* an. Die Kombination der beiden Kontinuen, die Bewegung spielt natürlich eine besonders wichtige Rolle. Die Betrachtung der Bewegung als Beziehung zwischen Raum und Zeit führt zu den ersten Ueberlegungen der *Funktionentheorie*. Bei der Ableitung der Zeitmessung aus der Bewegung tritt die *Zahl* wesentlich in Erscheinung. Es zeigt sich hier, dass Aristoteles die Schwierigkeiten des Uebergangs von der *Anzahl* zur allgemeinen *Grösse* durchaus empfand, ohne natürlich mehr als eine Ahnung davon zu haben, dass dieser Uebergang durch die unendliche Zahlenfolge führen muss.

Einleitung.

Die Mathematik ist für viele Menschen reizvoll. Zuerst macht Einzelnes Vergnügen, wie besondere Zahlenverknüpfungen oder einzelne geometrische Gestalten, etwa die regulären Körper; dann erfreuen allgemeinere Eigenschaften von Zahlen und geometrischen Figuren, wie etwa Zerlegungsgesetze oder Konstruktionen. Endlich erfüllt die eindringende Betrachtung grosser Systeme von Sätzen, der wunderbare Bau ganzer Disziplinen, wie sie sich auf einfacher Grundlage durch strenge Verknüpfung zu direkter Betrachtung unzugänglichen Höhen erheben, den reifen Mathematiker mit tiefer Befriedigung. Das ist ganz besonders der Fall, wenn er selbst an diesem Bau arbeitet, wenn vielleicht ganze Teile erst durch seine Ueberlegung ans Licht kommen.

Ueberall ist hier die Freude an der vollendeten Gestalt wesentlich. Dagegen haben Betrachtungen über die Elemente dieser Gestalten, etwa über das Wesen der ganzen Zahl oder des Raumes und seiner Teile diesen ursprünglichen Reiz nicht, und obwohl die Vorstellungen von diesen Elementen die Grundlagen für jedes mathematische Schaffen sind, haben sich die Mathematiker zu allen Zeiten nur wenig mit ihnen beschäftigt. Von dem Reiz des Schöpferischen unwiderstehlich angezogen streben sie in ihrer Gedankenarbeit nur dem Ziel, der Vollendung zu. Die Philosophen dagegen wollen vor allem sich ihrer selbst und ihrer Tätigkeit immer tiefer bewusst werden, und diese Neigung führt viele unter ihnen dazu, sich auch mit den Grundlagen der Mathematik zu beschäftigen, oft bevor sie die notwendigen Vorstellungen von dem über die Grundlagen sich erhebenden Bau haben. So gibt es doch nur ganz wenige Philosophen, die etwas Wesentliches zur Grundlagenforschung beitragen konnten. Diese Wenigen sind aber von grosser Bedeu-

Max Dehn, "Raum, Zeit und Zahl bei Aristoteles vom mathematischen Standpunkt aus" [Space, time and number in Aristotle from a mathematical perspective], in: *Scientia* 60 (1936), pp. 12–21, 69–74.

SPACE, TIME, AND NUMBER IN THE WORKS OF ARISTOTLE FROM A MATHEMATICAL POINT OF VIEW

FIRST PART

Aristotle was not a productive mathematician, and in all his works there are only very few individual facts relating to pure or applied mathematics. However, he dedicated considerable attention to the topic of *space and time as continua*, at first on their properties on "a small scale". These reflections are part of topology. Naturally, the combination of the two continua, i.e. movement, plays a major role. The consideration of movement as a relation between space and time leads to the first reflections on the *theory of functions*. In deriving time measurement from movement, the concept of number takes on a significant role. We see that Aristotle indeed felt the difficulties of the transition from *number* to general *quantity*, though of course without having more than an inkling that this transition must lead through infinite numerical sequences.

INTRODUCTION.

Mathematics is of interest to many people. First, there is pleasure in specific individual things such as special combinations of numbers or individual geometrical shapes such as the regular bodies; then, people take delight in the more general properties of numbers and geometrical forms, such as decomposition laws or constructions. And finally, it gives the mature mathematician great satisfaction to methodically examine large systems of propositions, to see the wonderful architecture of entire disciplines rise as a result of stringent combination from simple fundamentals to heights inaccessible to direct observation. This is especially the case when the mathematician himself is personally involved in the construction, when perhaps there are entire parts of the structure that would not have come to light without his thinking.

In all of this, what is essential is the ability to delight in the consummate form. Considerations involving the elements of these forms, however, for instance the essence of the integer or of space and its parts, do not have this primal appeal, and although an understanding of these elements is the foundation for any mathematical activity, mathematicians have never paid more than little attention to them. Irresistibly drawn by the appeal of creativity, they have tended to focus their attention only on accomplishing the goal, on striving for perfection. Philosophers, on the other hand, principally strive to become increasingly aware of who they are and what they do, and this tendency leads many of them to also delve into the foundations of

tung gewesen bei dem Prozess, der das mathematische Schaffen *bewusster macht*. Und dieser Prozess ist für die *dauernde* Fruchtbarkeit dieses Schaffens absolut notwendig.

Es scheint mir nun, dass man bei *Aristoteles* sehr wichtige Untersuchungen über die Grundlagen finden kann. Sie sollen uns im folgenden beschäftigen. Das Werk der Mathematiker hat sich im Laufe der Jahrtausende über sehr verschiedene Stufen der Bewusstheit erhoben. In der vorgriechischen Zeit fehlt, soweit wir wenigstens heute wissen, durchaus der *formulierte* Beweis für die gefundenen Resultate, und erst in unserer Zeit ist allmählich die axiomatische Methode und der *strenge* Beweis entstanden, d. h. die genaue Darstellung des bisher mehr oder weniger unbewussten Fortschreitens in den Ueberlegungen. Z. B. war die für diese Darstellung so wichtige Begriffsbildung der vollständigen Induktion im Altertum gar nicht vorhanden.

Die vorgriechische Mathematik benutzte primitive Kenntnisse über ganze Zahlen und einfache geometrische Gebilde wie Punkte, Gerade, Ebenen usw. Die ihnen zugrunde liegenden Axiome sind in den Elementen Euklids unvollkommen dargestellt. Sie sind erst in den letzten hundert Jahren so vollständig gefunden und aufgestellt, dass die axiomatische Methode durchgeführt werden konnte. Bei Euklid fehlt z. B. ganz die Darstellung der grundlegenden Eigenschaften der Anordnung von Punkten auf einer Geraden oder von Punkten einer Ebene in Bezug auf eine Gerade usw., die überall, aber eben stets unerwähnt oder jedenfalls unformuliert, benutzt werden. Bei Aristoteles finden wir nun einen Versuch, die *grundlegenden Tatsachen der Anordnung* darzustellen. Er erörtert dann im engsten Anchluss ausführlich die auch von anderen Philosophen betrachteten Eigenschaften des *Kontinuums*, sowohl des räumlichen wie des zeitlichen. Es ist erstaunlich, dass man an dieser Stelle bei Aristoteles auch Ansätze zu *funktionalen Betrachtungen* findet. Ueber diese aristotelischen Auseinandersetzungen möchte ich in den ersten drei Paragraphen berichten.

Diese Ideen und Ansätze von Aristoteles haben die griechische Mathematik wenig beeinflusst. Die Lehren vom Kontinuum, Mengenlehre und Topologie, sind keine hundert Jahre alt, die Funktionentheorie beginnt erst im 17. Jahrhundert. Und doch ist Aristoteles indirekt durch Nicolaus Cusanus (15. Jahrhundert), Barrow (17. Jahrhundert) und manche anderen Mathematiker, vielleicht auch durch Bolzano (19. Jahrhundert) von sehr grosser Bedeutung für die mächtige Entwicklung dieser Disziplinen geworden.

An die Kontinuumstheorie schliessen sich die Untersuchungen über den *absoluten Raum* an. Wir werden (in § 4) finden, dass die aristotelische Anschauung in merkwürdiger Vollständigkeit mit den modernsten physikalischen Anschauungen übereinstimmt. Ebenso

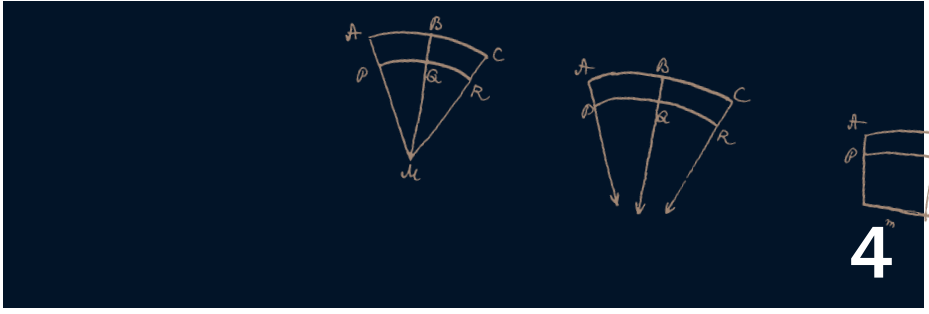
mathematics, often even before having a sufficient notion of the structure which towers above these foundations. There are therefore only very few philosophers who have contributed anything of particular value to foundational research. However, these few have been extremely important for the process of making mathematical creativity more aware. And this process is absolutely necessary for ensuring that this creativity remains fruitful on an ongoing basis.

It seems to me that *Aristotle's* work contains very important ideas on the foundations [of mathematics]. We shall discuss these in the coming pages. The work of mathematicians has evolved through very different stages of awareness in the course of the millennia. In pre-Greek times, there seems to have been no concept of *formulated* proof of results, at least, as far as we know today, and it is only in our time that the axiomatic method and the concept of *rigorous* proof has gradually come into being, i.e. the precise description of what had until now been a more or less unconscious advance in one's thoughts. The concept of complete induction for instance, which is so important for this description of thought processes, did not exist at all in ancient times.

Pre-Greek mathematics had primitive knowledge about integers and simple geometrical forms like points, straight lines, planes etc. The axioms underlying them are imperfectly described in Euclid's Elements. It is only in the past hundred years that they have been discovered and sufficiently well established to allow the axiomatic method to be applied. In Euclid's works, for instance, there is no mention whatsoever of the fundamental properties of the order of points on a straight line or of points in a plane in relation to a straight line etc., which are used everywhere but always left unmentioned or at least not formulated. In Aristotle, however, we find the attempt to describe the *fundamental facts of order*. He subsequently discusses in detail the properties of the *continuum*, both of space and time, which also have been examined by other philosophers. It is astounding that at this point in Aristotle one also finds an attempt at *functional reflections*. I would like to give an account of these Aristotelian considerations in the first three paragraphs.

Aristotle's ideas and approaches had little influence on Greek mathematics. The theory of the continuum, set theory and topology, are not yet one hundred years old, and the theory of functions did not begin until the 17th century. And yet Aristotle has indirectly become very important for the dynamic development of these disciplines through Nicolaus Cusanus (15th century), Barrow (17th century) and many other mathematicians, possibly also through Bolzano (19th century).

The theory of the continuum was followed by research on *absolute space*. We shall see (in § 4) that the Aristotelian approach is, strangely enough, highly compatible with the most modern physical ideas.



Writings

This section of the exhibition displays a selection of classic monographs, influential textbooks, and in some cases the collected works and papers of German-Jewish scholars. The list of authors and works covers a wide variety of mathematical fields and their applications. It completely disproves anti-Semitic stereotypes that had claimed the existence of a typical form of "Jewish mathematics", remote from geometrical intuition or from applications.

$$f(x) = f(x\sigma)\cdot\left(1-\frac{\lambda\sigma x}{1-\sigma x}\right)$$

$$= f(x\sigma^2)\cdot\left(1-\frac{\lambda\sigma x}{1-\sigma x}\right)\left(1-\frac{\lambda\sigma^2 x}{1-\sigma^2 x}\right) = \dots$$

$$f(x) = \prod_{n=1}^{\infty}\left(1-\frac{\lambda\sigma^n x}{1-\sigma^n x}\right) = \prod_{n=1}^{\infty}\left[1-(\lambda+1)\sigma^n x\right] : \prod_{n=1}^{\infty}(1-\sigma^n x)$$

B. Bergmann et al. (eds.), *Transcending Tradition*

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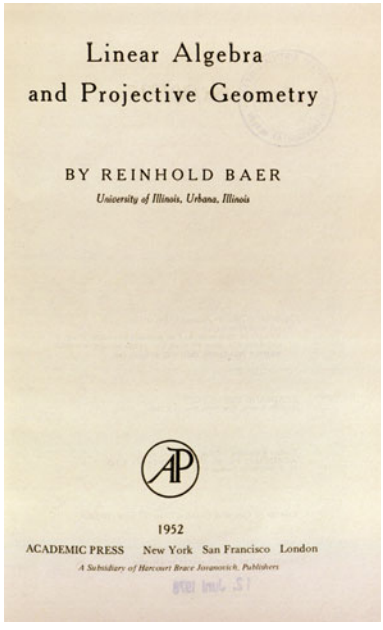

Linear Algebra
and Projective Geometry

BY REINHOLD BAER

University of Illinois, Urbana, Illinois

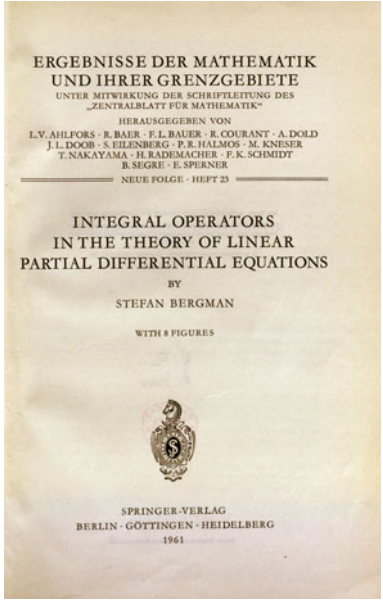
1952

ACADEMIC PRESS New York San Francisco London

A Subsidiary of Harcourt Brace Jovanovich, Publishers

Reinhold Baer

The primary focus of Reinhold Baer's work was group theory, particularly the theory of abelian groups. Many of his ideas and results have become indispensable elements of modern group theory; for decades, his suggestions provided direction for the work of many mathematicians. The study of abelian groups also led Baer to provide an algebraic basis for projective geometry. He understood projective geometry as a special type of lattice, the lattice of all linear subspaces of a vector space. The next obvious step was to interpret the lattice of subgroups of an abelian group as a generalized projective geometry and an isomorphism of lattices of subgroups as a projectivity of the groups forming the basis. The principal results are found in Baer's work "A Unified Theory of Projective Spaces and Finite Abelian Groups", *Transactions of the AMS* 52 (1942), 283-343. The book *Linear Algebra and Projective Geometry* describes the realization of projective geometries through vector spaces over certain rings, of projectivities through semilinear transformations and of dualities through semi-bilinear forms. The lattice theoretic point of view, however, loses in significance compared to the position it occupied in the paper of 1942. For the first time, the book provided a purely algebraic foundation for projective geometry.


ERGEBNISSE DER MATHEMATIK
UND IHRER GRENZGEBIETE

UNTER MITWIRKUNG DER SCHRIFTLEITUNG DES
„ZENTRALBLATT FÜR MATHEMATIK"

HERAUSGEGEBEN VON

L.V. AHLFORS · R. BAER · F.L. BAUER · R. COURANT · A. DOLD
J.L. DOOB · S. EILENBERG · P.R. HALMOS · M. KNESER
T. NAKAYAMA · H. RADEMACHER · F.K. SCHMIDT
B. SEGRE · E. SPERNER

NEUE FOLGE · HEFT 23

INTEGRAL OPERATORS
IN THE THEORY OF LINEAR
PARTIAL DIFFERENTIAL EQUATIONS

BY

STEFAN BERGMAN

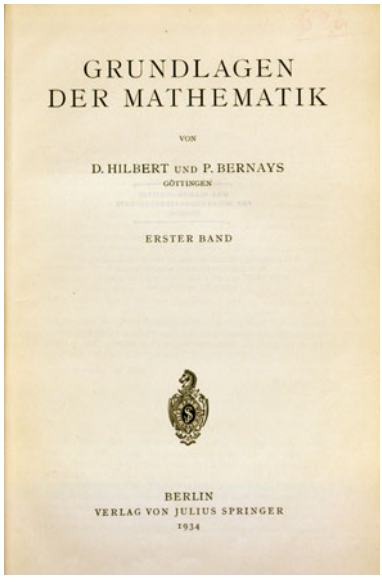
WITH 8 FIGURES

SPRINGER-VERLAG
BERLIN · GÖTTINGEN · HEIDELBERG
1961

Stefan Bergmann

Stefan Bergmann, whose first degree was in engineering, joined Richard von Mises's Institute for Applied Mathematics at Berlin University in 1921. His main area of study was the theory of analytic functions of one or several complex variables and its application to problems of electrodynamics and the mechanics of continua. Some of Bergmann's well-known discoveries are the Bergmann reproducing kernel, as well as the Bergmann-Shilov boundary for certain classes of domains in the theory of functions of several complex variables and the related generalization of Cauchy's integral formula. In the monograph *Integral Operators in the Theory of Linear Partial Differential Equations*, Bergmann constructed integral operators which transform analytic functions of complex variables into solutions of various classes of linear partial differential equations with analytic coefficients. This led to a unified theory for a large class of linear partial differential equations. The starting point for this idea is the connection – well-known since Euler – that exists between harmonic functions of two real variables and analytic functions of a complex variable.

Paul Bernays


GRUNDLAGEN
DER MATHEMATIK

VON

D. HILBERT UND P. BERNAYS

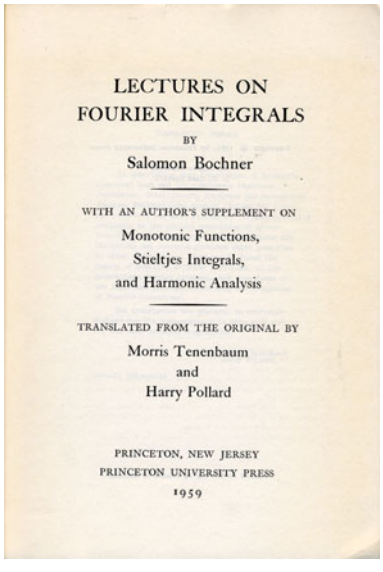
GÖTTINGEN

ERSTER BAND

BERLIN
VERLAG VON JULIUS SPRINGER
1934

Once a student of the philosopher Leonard Nelson, Paul Bernays initially published philosophical texts. In 1919, in response to David Hilbert's invitation, he left Zurich for Göttingen in order to work with Hilbert on foundational questions of mathematics, specifically on problems of proof theory. In contrast to many logicians before him, Bernays clearly understood the difference between syntax and semantics and made careful distinctions between provable formulas and valid formulas. The most important result of Hilbert and Bernays's collaboration was the two-volume *Grundlagen der Mathematik* [Foundations of mathematics], which remained the standard work in proof theory for decades. While the general approach to the problem can be traced back to Hilbert, it was Bernays alone who carried out the work. Here he developed the ε–calculus and the ε–theorems for the elimination of quantifiers and provided decision procedures for various theories. He offered the first detailed proof of Gödel's second incompleteness theorem and, in addition, the first correct proof of Herbrand's theorem. Finally, he came up with a proof-theoretical version of Gödel's completeness theorem for first-order logic.

Salomon Bochner


LECTURES ON
FOURIER INTEGRALS

BY

Salomon Bochner

WITH AN AUTHOR'S SUPPLEMENT ON

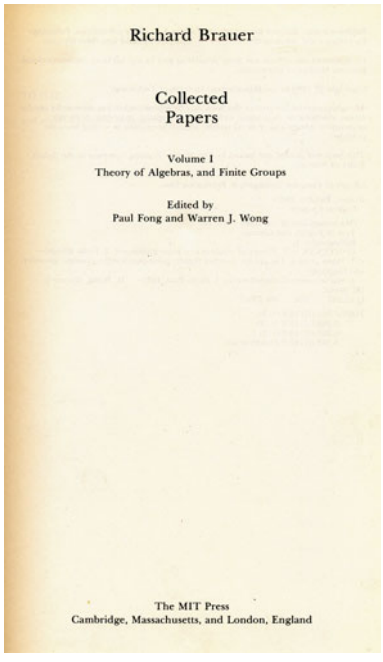
Monotonic Functions,
Stieltjes Integrals,
and Harmonic Analysis

TRANSLATED FROM THE ORIGINAL BY

Morris Tenenbaum
and
Harry Pollard

PRINCETON, NEW JERSEY
PRINCETON UNIVERSITY PRESS
1959

Salomon Bochner began his career as Harald Bohr's assistant with important works on almost periodic functions. As a lecturer in Munich from 1926 onwards, he worked on Fourier analysis and made his most important discoveries in this field. The high point of this creative period was his *Vorlesungen über Fouriersche Integrale* [Lectures on Fourier Integrals], a classic in mathematical literature. The Fourier transform is of great importance for a range of application-oriented fields within mathematics, e.g. for probability theory (characteristic functions). In 1955, Bochner wrote a similarly influential book, *Harmonic Analysis and the Theory of Probability*. Bochner's most important result in the *Vorlesungen* is the characterization of the Fourier-Stieltjes transform of positive measures as positive definite functions. This result provided the starting point for the subsequent development of abstract harmonic analysis. Bochner's book also contained the germ of the later development of the theory of distributions. It should also be noted that the extension of the Lebesgue integral to functions with values in a Banach space can also be traced back to the so-called Bochner integral.


Richard Brauer

Collected Papers

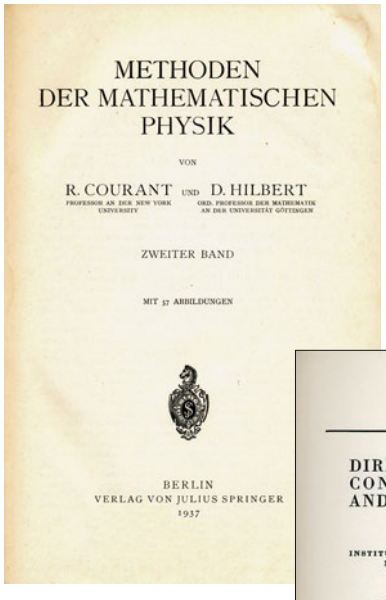
Volume I
Theory of Algebras, and Finite Groups

Edited by
Paul Fong and Warren J. Wong

The MIT Press
Cambridge, Massachusetts, and London, England

Richard Brauer

Without a doubt, Richard Brauer was one of the most important algebraists of the 20th century. He has exerted an immense influence on the development of algebra both through his own vital contributions as well as through those of his numerous students. Picking up the thread of Issai Schur's work, Brauer began with papers on group representations emphasizing new algebraic methods. A number of these results flowed into Hermann Weyl's book *The Classical Groups* (1939). The central element of Brauer's theory of normal division algebras is a commutative group of isomorphism classes of these algebras (Brauer group). The properties of the Brauer group lead to important conclusions regarding the structure of simple algebras. In 1931, in collaboration with Emmy Noether and Helmut Hasse, Brauer demonstrated that every rational division algebra is cyclical over its center. His meanwhile well-known theory of modular representations of finite groups opens up new insights into the structure of groups and their characters as well as new ideas about the representation theory of algebras. Brauer also made innovative contributions to number theory (Artin *L*-function) and to the theory of simple groups. The first volume of his three-volume *Collected Papers* is on display. This volume also contains a description of Brauer's mathematical development, written by Brauer himself, James Alexander Green's obituary of Brauer and a complete list of all of Brauer's publications.


METHODEN
DER MATHEMATISCHEN
PHYSIK

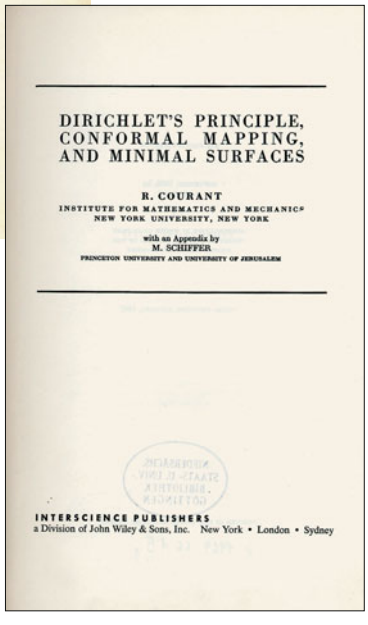
VON

R. COURANT UND D. HILBERT

ZWEITER BAND

MIT 57 ABBILDUNGEN

BERLIN
VERLAG VON JULIUS SPRINGER
1937


DIRICHLET'S PRINCIPLE,
CONFORMAL MAPPING,
AND MINIMAL SURFACES

R. COURANT
INSTITUTE FOR MATHEMATICS AND MECHANICS
NEW YORK UNIVERSITY, NEW YORK

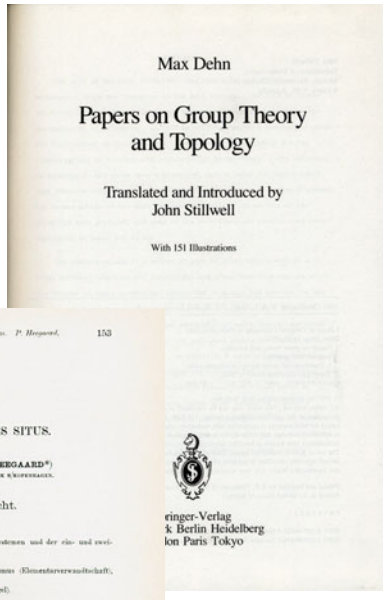
with an Appendix by
M. SCHIFFER
PRINCETON UNIVERSITY AND UNIVERSITY OF JERUSALEM

INTERSCIENCE PUBLISHERS
a Division of John Wiley & Sons, Inc. New York • London • Sydney

Richard Courant

Analysis and its application to physics were Richard Courant's primary interests. Certainly his most important contribution is the Courant maximum-minimum principle, which yields an independent representation of the eigenvalues of compact Hermitian linear operators in a Hilbert space. Courant's academic organizational efforts also focused on the extension of applied analysis; they culminated in the foundation of the New York institute which today bears his name. Niels Bohr once praised Courant as the man who made mathematics accessible to physicists; indeed, the two-volume *Methoden der Mathematischen Physik* [Methods of Mathematical Physics], co-authored by Courant and Hilbert, has been of lasting influence. The second of Courant's books on display is organized around a topic which links all of his work, beginning with his doctoral dissertation and the text he wrote for his habilitation: Dirichlet's principle, rehabilitated by Hilbert, and its application to problems of mathematical physics and to questions of conformal mappings and minimal surfaces. His extraordinarily successful book *What is Mathematics?* sought to expose a broad, educated audience to the beauty of mathematics as an element of the intellectual culture of humanity.

Max Dehn

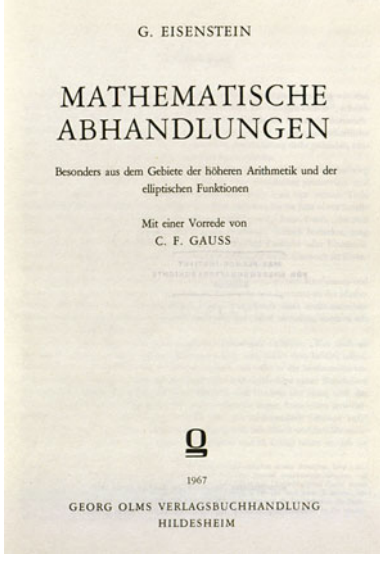


Max Dehn was primarily a geometer. He became especially well-known as the first mathematician to solve one of the 23 problems that David Hilbert had presented at the 1900 International Congress of Mathematicians in Paris for mathematicians of the new century to work upon. In 1902, Dehn solved the third Hilbert problem by demonstrating the existence of polyhedra not equivalent by dissection but having the same volume. On display here is Dehn and Poul Heegaard's 1907 "Analysis Situs" article in *Enzyklopädie der Mathematischen Wissenschaften* [Encyclopedia of Mathematical Sciences]. It offers the first systematic representation of a research direction of great depth and beauty – going back to Euler, Gauss, Listing, Riemann, Möbius, Betti and Poincaré – which was then called "analysis situs" and would today probably be called geometrical topology. In the period following the publication of this article, Dehn also made important contributions to topology, specifically to the theory of topological manifolds (Dehn's Lemma) and to the study of fundamental groups. He also had a lively interest in the foundations of geometry and worked successfully in the field of the history of mathematics.

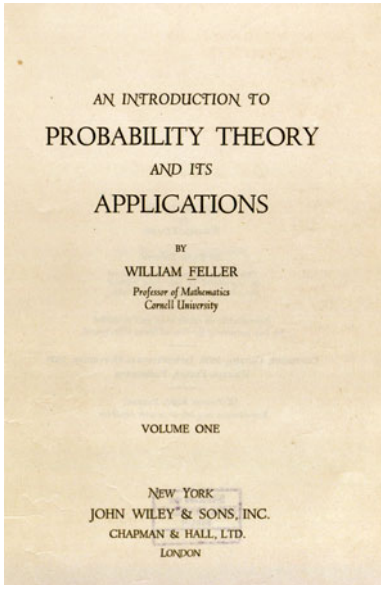

III AB 3. ANALYSIS SITUS.

Inhaltsübersicht.

Ferdinand Gotthold Eisenstein

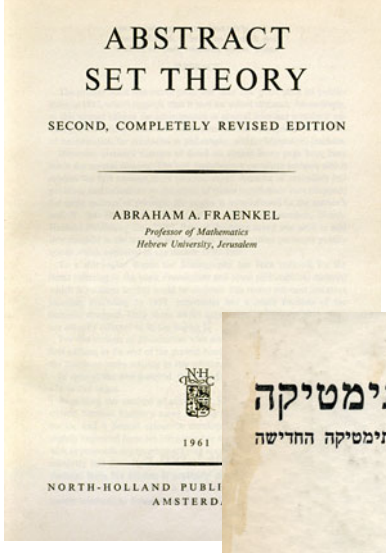


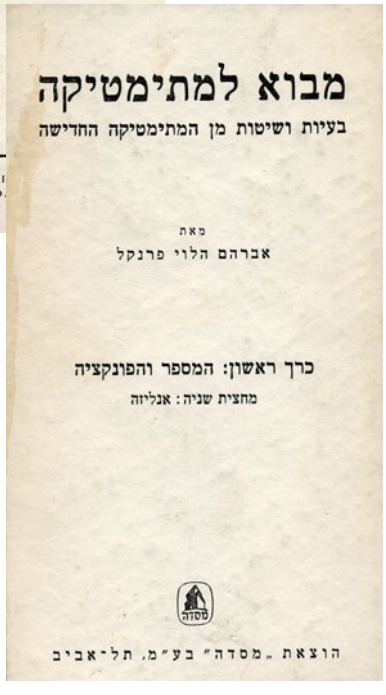
Ferdinand Gotthold Eisenstein is among those mathematical geniuses who, like Niels Henrik Abel and Évariste Galois, died young and yet profoundly influenced the development of mathematics. In a letter to Alexander von Humboldt dated 14 April 1846, Gauss wrote of him: "I will not refrain from declaring that I view Eisenstein's talent to be one which nature dispenses to only a few in each century." The development that finally led to the general reciprocity law for n^{th} power residues takes as its starting point, among others, Eisenstein's work on cubic and biquadratic residues. Today Eisenstein series constitute an important element in the theory of modular forms. They stem from his work on quadratic and cubic forms. The irreducibility criterion named after him resulted from his work on the division of the lemniscate. He also made important contributions to the theory of elliptic functions and to the theory of quadratic partition of prime numbers. During his lifetime, the volume *Mathematische Abhandlungen* [Mathematical treatises] was published with a foreword by no less a figure than Gauss, who wrote: "The present essays include so much that is excellent and solid that with this book, the writer will be assured an honored place alongside his predecessors, to whose work this is a worthy contribution." On display is a reprint of this volume. A complete edition of Eisenstein's works in two volumes was published in New York in 1975.


AN INTRODUCTION TO
PROBABILITY THEORY
AND ITS
APPLICATIONS
BY
WILLIAM FELLER
Professor of Mathematics
Cornell University
VOLUME ONE
NEW YORK
JOHN WILEY & SONS, INC.
CHAPMAN & HALL, LTD.
LONDON

William (Willy or Vilim) Feller

William Feller worked chiefly in the field of probability theory. In addition to extending this theory, however, he was also interested in applications, statistics for example. His numerous works on the application of probability theory in genetics are highly valued by geneticists. Using Kolmogorov's work on Markov processes as a starting point, Feller employed semigroup theory and functional analysis as an aid in studying very general types of Markovian transition probabilities. He found an elegant representation for the infinitesimal generator of the most general one-dimensional diffusion. His most influential work is the two-volume text on display, *An Introduction to Probability Theory and Its Applications*, still a classic of stochastics. The combination of a strict foundation in measure theory with excellent and extensive use of all relevant analytical techniques, including many interesting and non-trivial traditional and new applications, is unique. Joseph L. Doob called this book "one of Feller's greatest legacies", going on to say that the "style has made the book popular even among nonspecialists, just as its elegance and breadth have made it an inspiration for specialists."

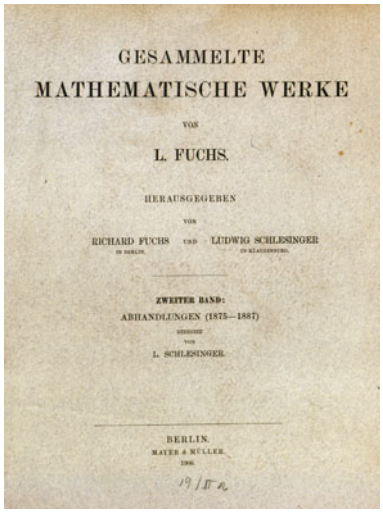

ABSTRACT
SET THEORY
SECOND, COMPLETELY REVISED EDITION
ABRAHAM A. FRAENKEL
Professor of Mathematics
Hebrew University, Jerusalem
1961
NORTH-HOLLAND PUBLI
AMSTERD


מבוא למתימטיקה
בעיות ושיטות מן המתימטיקה החדישה
מאת
אברהם הלוי פרנקל
כרך ראשון: המספר והפונקציה
מהדורה שניה: אנליזה
מסדה
הוצאת „מסדה" בע"מ, תל־אביב

Abraham A. Fraenkel

Abraham Fraenkel worked mainly on set theory and the foundations of mathematics. In his efforts to axiomatize set theory (1908), Ernst Zermelo based his axiom of subsets on the still vague concept of "definite property". Fraenkel recognized this weakness and managed to correct it. On the basis of what we now know as the ZF or Zermelo-Fraenkel axiom system, he provided a basis for set theory including theories of ordered and well-ordered sets. ZF and, modified by Thoralf Skolem, ZFC (without or with the axiom of choice) reflect a now generally accepted basis for the foundation of set theory and for foundational investigations. Fraenkel wrote a number of books, beginning with *Einleitung in die Mengenlehre* [Introduction to set theory]. The exhibition includes his book *Abstract Set Theory*, an excellent educational work written primarily for beginners. Its distinctive feature is a 128-page (!) bibliography, which is, one could say, obligatory for every researcher working in the field of history of set theory. Fraenkel's early works on rings are important for algebra. His memoirs, *Lebenskreise. Aus den Erinnerungen eines jüdischen Mathematikers* [Rings of life. Memories of a Jewish mathematician] (1967), are also of special historical interest. Displayed here is one of five volumes of his *Introduction to Mathematics*, an introduction to the foundations and development of modern mathematics, the first of its kind to be written in Hebrew.

Immanuel Lazarus Fuchs

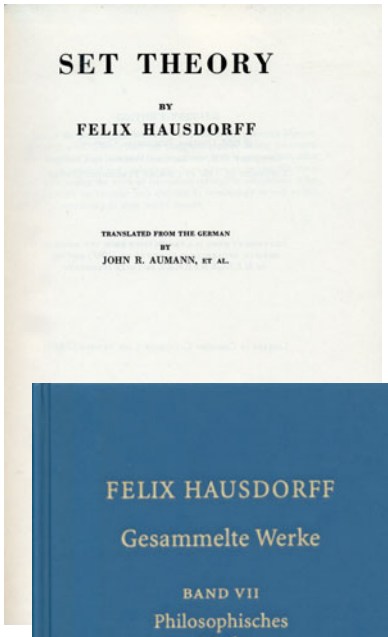

GESAMMELTE
MATHEMATISCHE WERKE
VON
L. FUCHS.
HERAUSGEGEBEN
VON
RICHARD FUCHS UND LUDWIG SCHLESINGER
ZWEITER BAND:
ABHANDLUNGEN (1875—1887)
L. SCHLESINGER.
BERLIN.
MAYER & MÜLLER.

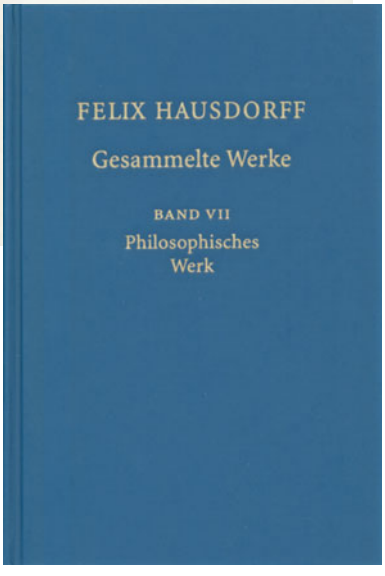
One of the leading mathematicians at Berlin University in the years after Kronecker, Kummer and Weierstrass, Immanuel Lazarus Fuchs worked primarily in the field of function theory, focusing on linear differential equations. His works constitute a bridge, to a certain extent, between the classic works of Gauss, Abel and Riemann on the hypergeometric series and related functions and modern theories of differential equations from Poincaré and Picard. Today, the theory of homogeneous linear differential equations in the complex domain is called Fuchsian theory, the goal of which is to generate representations for the integrals in the neighborhood of singular points of a differential equation. A homogeneous linear ordinary differential equation of n^{th} degree with coefficients $p_k(z)$ which are single-valued in the complex plane and regular except for isolated singularities is called an equation of the Fuchsian type if all of its singularities (including $z = \infty$) are regular singular points. Fuchs characterized this class of differential equations by means of necessary and sufficient criteria. Fuchs's theorem provides a condition when $z = a$ is a regular singular point. Fuchs's *Gesammelte Mathematische Werke* [Collected mathematical works] were published in three volumes. Volume two, containing many of his innovative works on linear differential equations in the complex domain, is on display in the exhibition.

Hans Hahn


Theorie der reellen Funktionen
Von
Dr. Hans Hahn
Erster Band
Mit 18 Textfiguren
Berlin
Verlag von Julius Springer
1921

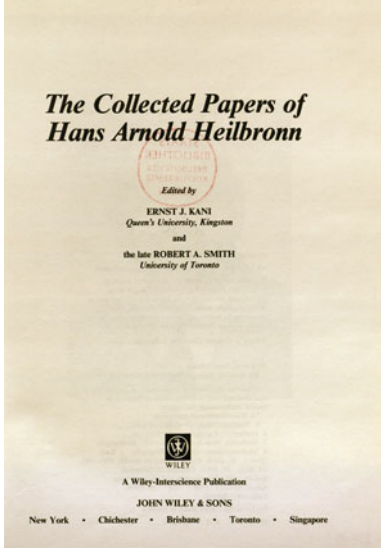
Hans Hahn was principally an analyst, but he also made contributions to topology (theory of continua) and to foundational questions of mathematics. For a long time, his book *Theorie der reellen Funktionen* [Theory of real functions] was considered a standard in the field. Hahn is one of the founders of linear functional analysis. In 1922, independently of Banach, he introduced the concept of complete linear normed spaces. By means of transfinite induction, he proved the theorem on the extension of bounded linear functionals (Hahn-Banach theorem), which constitutes a significant starting point for the general theory of duality, even before Banach. Hahn also made important contributions to the calculus of variations and to harmonic analysis. Independently of Mazurkiewicz, he found necessary and sufficient conditions under which a set in a metrizable space is the continuous image of a line (Hahn-Mazurkiewicz theorem). As a philosophical thinker, Hahn left his mark on, and advocated, the logical empiricism of the "Vienna Circle" and, as regards the foundational questions of mathematics, was a decided supporter of Hilbertian formalism.





Felix Hausdorff

Felix Hausdorff was an exceptionally multifaceted mathematician. Numerous concepts, theorems and processes bearing his name demonstrate his lasting impact: Hausdorff space, Hausdorff's separation axiom, Hausdorff metric, Hausdorff measure, Hausdorff dimension, Hausdorff paradox, Hausdorff's recursion formula of aleph exponentiation, Hausdorff gaps, Hausdorff's maximal set theorem, Hausdorff's moment problem, Hausdorff's procedure in limitation theory, Hausdorff-Young inequality, the Baker-Campbell-Hausdorff formula. His most influential work was *Grundzüge der Mengenlehre* [Fundamentals of set theory]. In this book, Hausdorff established general topology as an independent mathematical discipline; the basic concept of "topological space" was introduced via the Hausdorff neighborhood axioms. Furthermore, the book includes Hausdorff's higher theory of ordered sets, a well worked-out theory of metric spaces, the first correct proof of Borel's strong law of large numbers, his paradoxical decomposition of the sphere and other original contributions. *Grundzüge* was a milestone on the road to modern set-theoretic, axiom-based mathematics. In 1927, Hausdorff's book *Mengenlehre* [Set theory] was published. It was announced as a second edition of *Grundzüge der Mengenlehre*, but in fact it was a totally new book, for the first time offering a cohesive presentation of descriptive set theory. An expanded new edition was published in 1935 and translated into English. This is the edition exhibited here. Additionally, volume VII of his *Gesammelte Werke* [Collected works], which contains the two philosophical books published under the pseudonym Paul Mongré as well as three remarkable essays on 19th century German philosopher Friedrich Nietzsche, is on display.



Hans Arnold Heilbronn

Hans Heilbronn, a student of Edmund Landau, achieved extraordinary results in the field of number theory. He proved Gauss's conjecture that the class number $h(-d)$ of imaginary quadratic number fields, with discriminant $-d < 0$, goes to infinity as $d \to \infty$. He also showed that there can be at most ten such fields with $h(-d) = 1$. In the field of additive number theory, in collaboration with Harold Davenport, Heilbronn further developed Vinogradov's methods and applied them to a series of additive problems of the type of Waring's problem. Heilbronn and Davenport attained important results in the field of analytic number theory in their work on the Epstein zeta function of a definite quadratic form with discriminant $-d$. It turns out that for $h(-d) \neq 1$ there is an infinite number of zeros in the area Re $s > 1$; so, for this zeta function there is no analog of the Riemann hypothesis when $h(-d) \neq 1$. By proving that there are only a finite number of real quadratic number fields with a Euclidean algorithm, Heilbronn opened a new direction for number-theoretical investigations, one which was taken up by Davenport and others using methods from the geometry of numbers. Heilbronn himself later showed that there were only a finite number of cyclic cubic fields with a Euclidean algorithm. Heilbronn's *Collected Papers* are on display in the exhibition.

Kurt Hensel


Zahlentheorie

Von

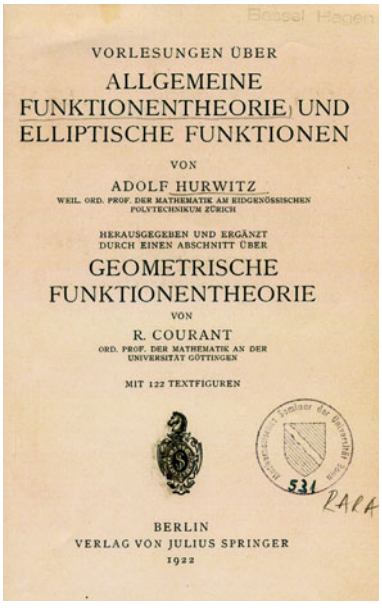
Dr. Kurt Hensel

o. ö. Professor der Mathematik an der Universität Marburg

Berlin und Leipzig
G. J. Göschen'sche Verlagshandlung G. m. b. H.
1913

In his renowned festschrift for Ernst Eduard Kummer, Kronecker had presented his version of an arithmetic theory of algebraic number fields. Kurt Hensel adopted Kronecker's ideas, combined them with Weierstrass's function theory, and in so doing created an arithmetic theory of algebraic function fields which was presented for the first time in summary form in a monograph co-authored by Georg Landsberg, *Theorie der algebraischen Funktionen* [Theory of algebraic functions] (1902). Weierstrass's method of power series expansions of algebraic functions gave Hensel the idea of attempting something analogous for algebraic numbers. This idea led Hensel to his most important discovery, the theory of p-adic numbers, which he presented in an abridged form in his 1908 *Theorie der algebraischen Zahlen* [Theory of algebraic numbers]. Hensel's textbook, *Zahlentheorie* [Number theory], is on display in the exhibition. Kürschak and Ostrowski's theory of fields with valuations provides the mathematical foundation for modern p-adics. Using Hensel's work as a starting point, Helmut Hasse developed a theory of algebras over algebraic number fields with broad applications in class field theory. In the 1950s, algebraic geometry took an arithmetic direction which relied significantly on the p-adics. The local-global principle in algebraic geometry and number theory reflects the modern form of the application of Hensel's methods.

Adolf Hurwitz


VORLESUNGEN ÜBER
ALLGEMEINE FUNKTIONENTHEORIE UND ELLIPTISCHE FUNKTIONEN
VON
ADOLF HURWITZ
WEIL. ORD. PROF. DER MATHEMATIK AM EIDGENÖSSISCHEN POLYTECHNIKUM ZÜRICH
HERAUSGEGEBEN UND ERGÄNZT DURCH EINEN ABSCHNITT ÜBER
GEOMETRISCHE FUNKTIONENTHEORIE
VON
R. COURANT
ORD. PROF. DER MATHEMATIK AN DER UNIVERSITÄT GÖTTINGEN
MIT 122 TEXTFIGUREN
BERLIN
VERLAG VON JULIUS SPRINGER
1922

Adolf Hurwitz was a versatile mathematician. Following in the footsteps of his teacher Weierstrass, he stimulated many areas of function theory, especially the theory of elliptic functions and its applications and the theory of $2n$-times periodic functions. He also worked on continued fractions, power series and diophantine equations, the latter in collaboration with his most important student, David Hilbert. Hurwitz's *Lehrbuch der Funktionentheorie* [Textbook of function theory] represented the first textbook depiction of Weierstrass's function theory and exerted an immense influence. Hurwitz's other areas of interest included geometry, number theory and the theory of differential equations. His main paper at the first International Congress of Mathematicians in Zurich in 1897, on the newer theories of analytic functions, introduced a broad public to the importance of Cantorian set theory for the first time and had great historical impact.


FUNDAMENTA NOVA

THEORIAE

FUNCTIONUM ELLIPTICARUM

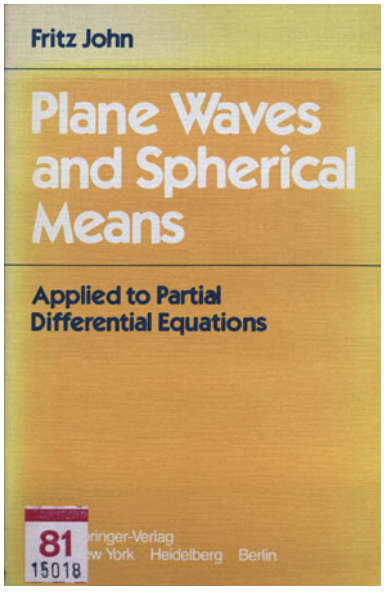
AUCTORE

D. CAROLO GUSTAVO JACOBO JACOBI

Regiomonti. Sumptibus fratrum Borntræger 1829.

Carl Gustav Jacob Jacobi

Gauss, Dirichlet and Jacobi were the most important German mathematicians in the first half of the 19th century. Carl Gustav Jacobi made ground-breaking contributions to function theory, the theory of differential equations, analytical mechanics, number theory and algebra. Felix Klein called the theory of elliptic functions, developed in an intellectual competition with Abel, "Jacobi's most original achievement". In 1829, Jacobi presented a summary report on this theory in Latin. Independent of one another, Jacobi and Abel arrived at the idea that rather than looking at elliptic integrals, which had already been much studied, they should study their inverse functions. In so doing they discovered the double periodicity of these functions. Jacobi also studied the inverse functions of general Abelian integrals. He discovered, for example, that there can be no functions on the whole complex plane with three periods, and yet there can be quadruply periodic functions of two variables. With the aid of Abel's theorem he developed a rigorous formulation of the inverse problem of abelian integrals. This problem was solved in the second half of the 19th century, thus establishing the theory of general theta functions. Jacobi himself provided impressive applications of his theory of elliptic functions in the fields of number theory, analytical mechanics and geometry. In physics, Jacobi's investigations in the area of partial differential equations were even more important than his contributions to the theory of elliptic functions: the so-called Hamilton-Jacobi theory played a fundamental role in elucidating quantum mechanics and in particular the dualism of waves and corpuscles. The theory of conjugate points in differential geometry and in the calculus of variations came from one of Jacobi's minor works. Correcting the mistake from Lagrange, Jacobi showed that triaxial ellipsoids exist as equilibrium figures of rotating liquids.



Fritz John

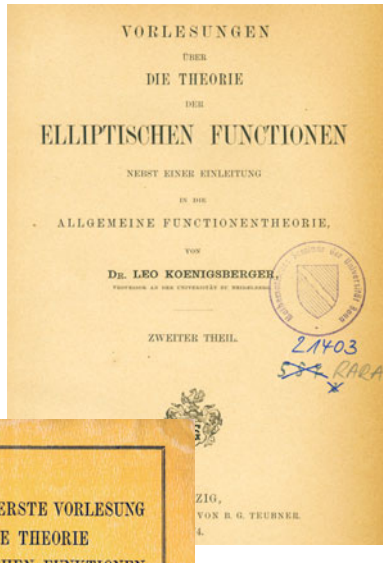
Fritz John studied in Göttingen, where he was awarded a doctorate in 1933; his first works were motivated and influenced by Hans Lewy, Richard Courant and Gustav Herglotz. They solve the problem of determining a function from its integrals over certain manifolds. An example is the inversion formula for the Radon transformation, which can be understood as the decomposition of a function into plane waves. The monograph *Plane Waves and Spherical Means*, which was published in 1955, was the first to summarize the relevant papers in this area, and it inspired other studies in the areas of Lie groups, partial differential equations and in particular computer tomography – this last also of great importance in the medical field. John's later contributions to many fields of analysis – for example the theory of partial differential equations, elasticity theory and hydromechanics as well as the theory of optimization and convexity – are at least of equal importance. John's collaboration with Louis Nirenberg on functions of bounded mean oscillation, which developed from his studies of the behavior of elastic bodies, is one of the most important mathematical discoveries of the last century and stimulated developments in many fields. In the last years of his life, John worked on singularities in

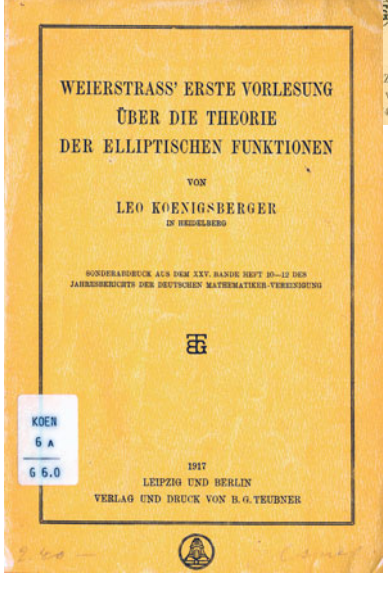
the solutions of non-linear wave equations; this has since developed into an important field of research.

Theodore von Kármán

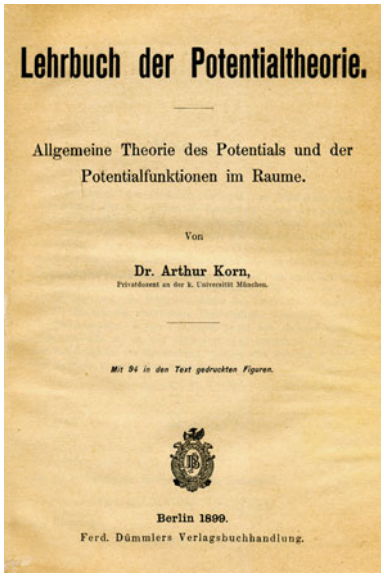
Theodore von Kármán's main areas of study were aerodynamics and hydrodynamics. As an engineer who had gained an outstanding knowledge of mathematics under Klein and Hilbert, he attempted to find solutions to physical and technical problems using mathematical methods. Kármán made fundamental contributions to the theory of turbulence: his "vortex street" introduced stability considerations in the theory of flows, and his integral condition enabled the calculation of turbulent boundary layer processes in the area of compressible flows. In flight mechanics, he created, together with Erich Trefftz, methods of computation for a new class of profiles, the Kármán profiles. He also made important contributions to thermodynamics and magnetogasdynamics as well as to aeronautical engineering. In the latter field, his singularity method for the calculation of thin missiles was of particular importance, as it became the starting point for supersonic aerodynamics.

Leo Königsberger


VORLESUNGEN
ÜBER
DIE THEORIE
DER
ELLIPTISCHEN FUNCTIONEN
NEBST EINER EINLEITUNG
IN DIE
ALLGEMEINE FUNCTIONENTHEORIE,
VON
DR. LEO KOENIGSBERGER,
ZWEITER THEIL.


WEIERSTRASS' ERSTE VORLESUNG
ÜBER DIE THEORIE
DER ELLIPTISCHEN FUNKTIONEN
VON
LEO KOENIGSBERGER
1917
LEIPZIG UND BERLIN
VERLAG UND DRUCK VON B. G. TEUBNER

Leo Königsberger's most important achievements lie in the field of function theory. He played a major role in making sure that the Riemannian foundation of function theory gained acceptance and was widely disseminated following Riemann's premature death. Königsberger's textbooks *Vorlesungen über die Theorie der elliptischen Functionen* [Lectures on the theory of elliptic functions] (1874) and *Vorlesungen über die Theorie der hyperelliptischen Integrale* [Lectures on the theory of hyperelliptic integrals] (1878) are of particular importance in this connection. Königsberger also expanded the Fuchsian theory of linear differential equations in the complex plane to systems of equations; his *Lehrbuch der Theorie der Differentialgleichungen mit einer unabhängigen Veränderlichen* [Textbook on the theory of differential equations in one independent variable] (1889) was a standard work during his time. Scientific contact with Hermann von Helmholtz inspired Königsberger to work in the field of analytical mechanics; his *Prinzipien der Mechanik* [Principles of mechanics] was published in 1901. Königsberger's best known work is probably his two-volume biography of Helmholtz, even today a valuable resource on the history of natural sciences in the 19th century. The same is true of his 1904 Jacobi festschrift (on the occasion of Carl Gustav Jacobi's 100th birthday). Königsberger's autobiography *Mein Leben* [My life] (1919) offers profound insights into the intellectual life in Germany in the decades around the turn from the 19th to the 20th centuries.


Lehrbuch der Potentialtheorie.

Allgemeine Theorie des Potentials und der Potentialfunktionen im Raume.

Von

Dr. Arthur Korn,

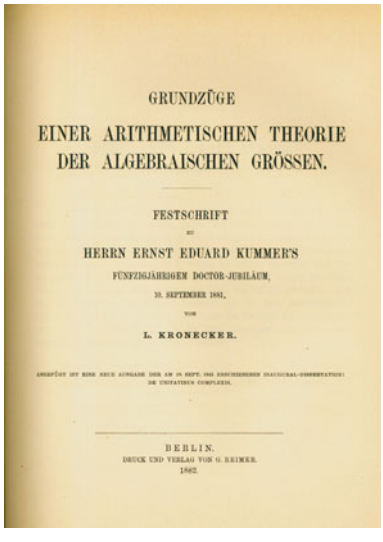
Mit 94 in den Text gedruckten Figuren.

Berlin 1899.

Ferd. Dümmlers Verlagsbuchhandlung.

Arthur Korn

In his dissertation (1882) Otto Hölder discovered that the Newtonian potential is twice continuously differentiable if its density function satisfies a "Hölder condition". Arthur Korn managed to provide the evidence that the potential as well as all solutions of Poisson's equation satisfy the same Hölder condition as the density, i.e. the right side of the Poisson equation. These discoveries – together with results obtained by Lyapunov, Lichtenstein, Kellogg and Schauder – led to the fundamental methods for the solution of boundary value problems for linear and nonlinear elliptic differential equations described in Gilbarg's and Trudinger's *Elliptic Partial Differential Equations of Second Order*. Also of significance are the inequalities in the linear elasticity theory, which were discovered by Korn and later generalized to non-linear problems by Fritz John and more recently by Stefan Müller and Gero Friesecke. In addition to his mathematical contributions to potential theory, Korn was also an accomplished experimentalist. In 1904 he succeeded in the first telegraphic transmission of images, a technique that he refined in the years to follow. Even earlier, in 1899, he had published the first German translation of Jean d'Alembert's *Traité de Dynamique* of 1743.


GRUNDZÜGE

EINER ARITHMETISCHEN THEORIE DER ALGEBRAISCHEN GRÖSSEN.

FESTSCHRIFT

HERRN ERNST EDUARD KUMMER'S

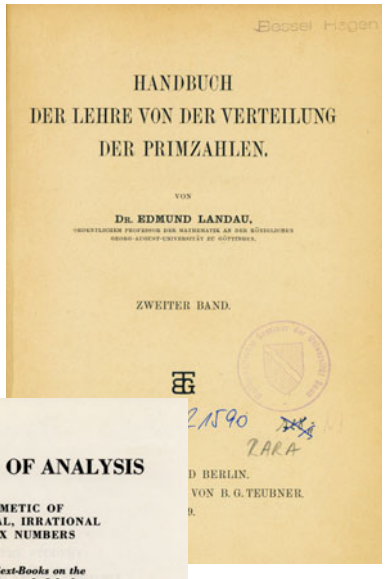
L. KRONECKER.

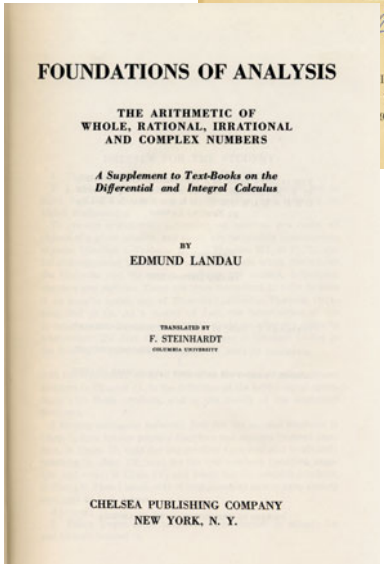
BERLIN.

Leopold Kronecker

Together with Kummer (who had been his teacher at secondary school) and Weierstrass, Leopold Kronecker helped establish Berlin's international reputation for mathematics in the second half of the 19th century. He achieved excellent results in algebra, number theory, and function theory, especially in discovering the reciprocal relations between these various fields. Starting from Abel's and Galois's works, Kronecker began with the study of relative abelian fields (the Kronecker-Weber theorem, Kronecker's "Jugendtraum" [youthful dream] theorem), thus laying the foundation for class field theory. Independently of Dedekind and using other methods, Kronecker created an arithmetic theory of algebraic number and function fields based on the concept of "divisor". This theory is recorded in his Kummer festschrift. This same publication also picks up the thread of Hensel's creation of the p-adic numbers. The intensified change in the direction of algebraic geometry toward arithmetic questions in the second half of the 20th century can be understood as a continuation of Kronecker's program. With regard to the foundational questions of mathematics, Kronecker ranks as a precursor of intuitionism.

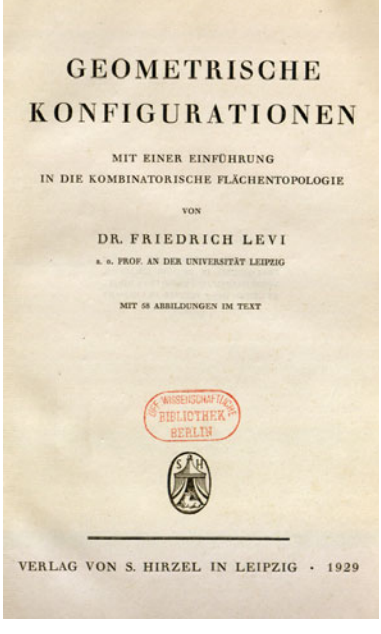
Edmund Landau



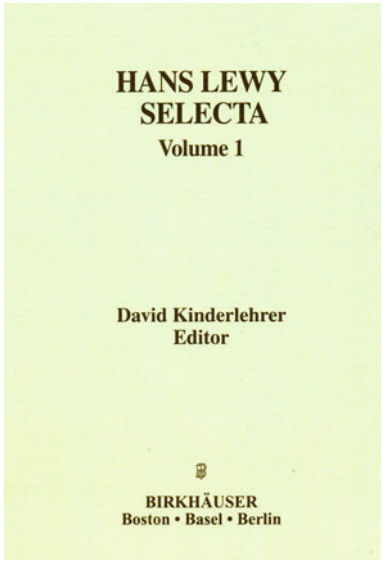


Edmund Landau's primary fields of study were analytic number theory and function theory. He is also especially well-known as the author of a number of monographs and textbooks. On display here is volume II of his *Handbuch der Lehre von der Verteilung der Primzahlen* [Handbook on the theory of the distribution of prime numbers]. This work is the first monograph to deal with analytic number theory. In the first volume, he proves the prime number theorem and related theorems with new, simpler methods and points out the connection of such theorems with Dirichlet's *L*-functions, especially the Riemann zeta function. Part 8 of volume I contains, inter alia, the famous Landau theorem on decomposition into eight cubes. Volume II deals with the Möbius function and the distribution of square-free integers. Part 3 of volume II contains the familiar Landau theorem of the sums of two squares; the final part contains the general theory of Dirichlet series. In a review of this work, Hausdorff wrote: "While the moral aspect might be self-explanatory, it is not possible to review a work like the present one with the dryness typical of this country without first of all acknowledging with gratitude what led to its composition: the writer's enthusiasm." This enthusiasm is also noticeable in Landau's three-volume *Vorlesungen über Zahlentheorie* [Lectures on number theory] (1927), a classic of mathematics literature, as well as in his other textbooks and monographs.

Friedrich Wilhelm Levi

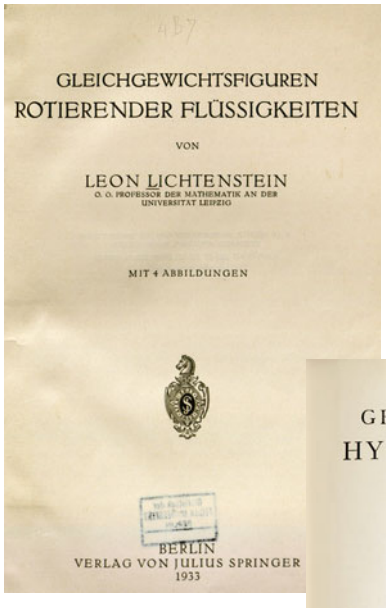


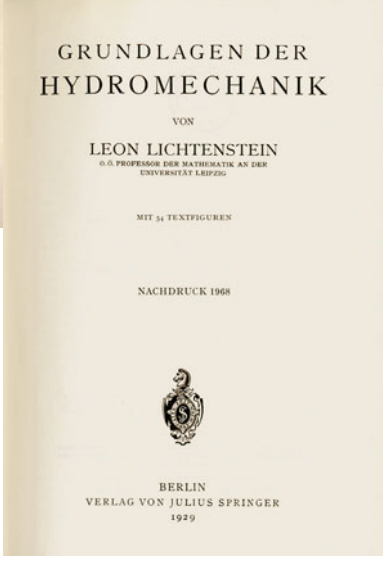
Friedrich Levi's principal areas of interest were algebra, geometry and topology. He is considered one of the founders of the theory of infinite abelian groups. Together with Reinhold Baer, he also worked successfully on subgroups of free groups as well as on free products. During his exile in India, Levi wrote an algebra textbook which must have exerted great influence on the development of this discipline in that country, for he has been called "the father of Indian algebra". His monograph *Geometrische Konfigurationen* [Geometrical configurations] bears the subtitle *Mit einer Einführung in die geometrische Flächentopologie* [With an introduction to geometrical surface topology]. Here in particular, Levi demonstrates the effectiveness of combinatorial methods in geometry. For surface topology, he demonstrates the close relationship of this method to algebra, thus paving the way for modern algebraic topology. Levi also made important contributions to convex geometry in the area of Helly's theorem; one problem he posed in this area was finally solved only quite recently.



Hans Lewy

A student of Courant in Göttingen, Hans Lewy was one of the most original mathematicians of his time. Together with Kurt Otto Friedrichs, he studied the solutions of hyperbolic partial differential equations by means of difference methods and in the process discovered the important condition that the size of the differences needs to be related to the characteristics of the solutions. These studies also led him to uncover new evidence of the analytical character of solutions to elliptic differential equations (Hilbert's 19th problem). Lewy's explorations of Monge-Ampère differential equations, which among other things also led him to the solution of Weyl's problem and Minkowski's problem in the field of differential geometry, have become well-known. Furthermore, he found estimates of the Jacobi determinant of diffeomorphisms which satisfy certain geometrically important systems of partial differential equations (these studies were later extended by E. Heinz). Lewy himself considered his most important contribution to be the proof of the analyticity of minimal surfaces bounded by an analytic curve or meeting an analytic supporting surface perpendicularly. He also worked on related problems in the field of hydromechanics. In 1957 he discovered the example of a smooth linear partial differential equation without a solution from which Hörmander developed a profound theory. Lewy's work on envelopes of holomorphy and on variational inequalities (in part with G. Stampacchia) also suggested new research directions.



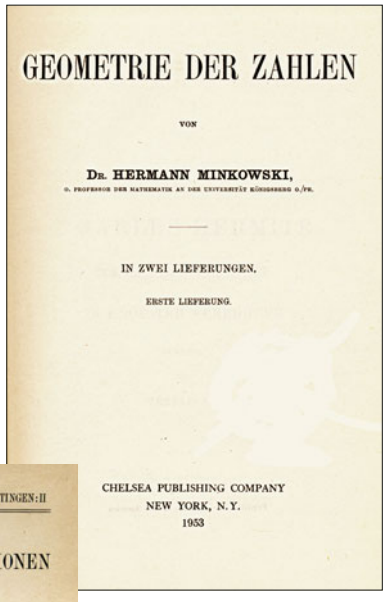


Leon Lichtenstein

Leon Lichtenstein, who received doctoral degrees in both engineering and philosophy in 1908 and worked as lead engineer at Siemens & Halske until 1920, made important contributions to the theory of partial differential equations, to the theory of integral and integro-differential equations, and the calculus of variations. The so-called "Schauder bounds" in the theory of elliptic differential equations can already be found quite precisely, for the two-dimensional case, in Lichtenstein's encyclopedia articles. Lichtenstein's optimal theorem on the introduction of conformal parameters is well-known. His tracing back of a class of integro-differential equations to a system of integral equations was of far-reaching importance. He was particularly concerned with the applications of analysis to hydrodynamics. His hydrodynamics textbook, which includes many of Lichtenstein's original results, especially in the chapter "Existenzsätze" [Existence theorems], is on display. He was particularly intrigued by the problem of equilibrium figures of rotating liquids, which has been analyzed repeatedly since Newton. In this field he proved several general existence and stability theorems, e.g. the existence of an equilibrium figure which corresponds to the separation

of a moon from its mother planet. By observing the ramification near any given equilibrium figure, which in contrast to Lyapunov's studies does not have to be an ellipsoid, he managed to advance a new integro-differential equation and to work out more clearly the basic ideas of ramification. Lichtenstein's methods have therefore contributed significantly to the development of non-linear functional analysis. For this reason, his classic *Gleichgewichtsfiguren rotierender Flüssigkeiten* [Equilibrium figures of rotating liquids] (1933) is on display here alongside his *Grundlagen der Hydromechanik* [Foundations of hydromechanics].

Hermann Minkowski


GEOMETRIE DER ZAHLEN

VON

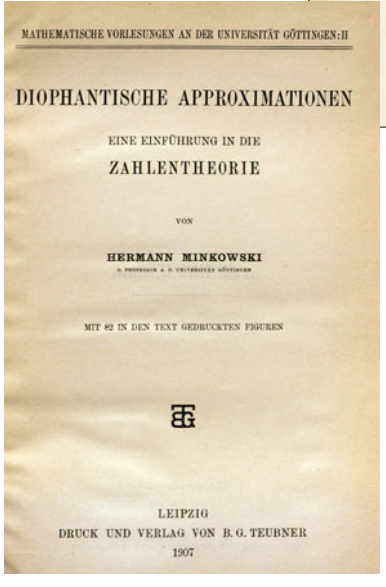
DR. HERMANN MINKOWSKI,

IN ZWEI LIEFERUNGEN.

ERSTE LIEFERUNG.

CHELSEA PUBLISHING COMPANY
NEW YORK, N.Y.
1953

One of the most versatile mathematicians of his time, Hermann Minkowski won the Paris Academy's Grand Prix des Sciences Mathématiques at the age of 18. He is the creator of convex geometry and of the related variants of non-Euclidian geometries which today bear his name. The applications of his geometrical ideas to number theory opened up a rich new area of research which Minkowski called the "geometry of numbers". In the arithmetic of algebraic number fields, for instance, it allowed estimates of the discriminant from which it was possible to draw far-reaching conclusions, e.g. that there are only a finite number of number fields with discriminants bounded by a given quantity. On display are Minkowski's books *Geometrie der Zahlen* [Geometry of numbers] (1896, 1910) as well as his *Diophantische Approximationen* [Diophantine approximations] (1907), which includes, among other topics, his results on the approximation of algebraic numbers by rational numbers by means of algorithms similar to expansions into continued fractions. Minkowski is acknowledged as the one who put the final touches, mathematically, on Einstein's special theory of relativity. His replacement of time and space as independent physical entities with a four-dimensional pseudo-Euclidian space-time (Minkowski space) created the basis for Einstein's later formulation of the general theory of relativity. Minkowski's works are also of great importance for relativistic electrodynamics.


MATHEMATISCHE VORLESUNGEN AN DER UNIVERSITÄT GÖTTINGEN: II

DIOPHANTISCHE APPROXIMATIONEN

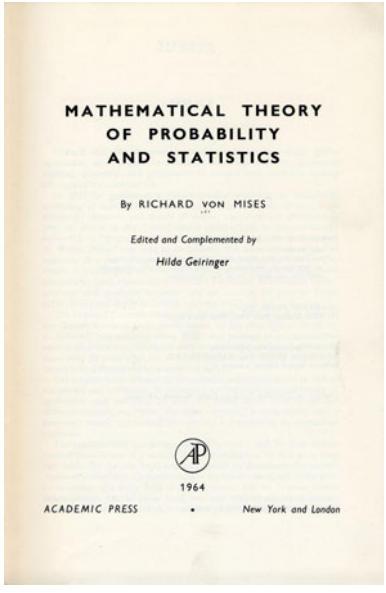
EINE EINFÜHRUNG IN DIE
ZAHLENTHEORIE

VON

HERMANN MINKOWSKI

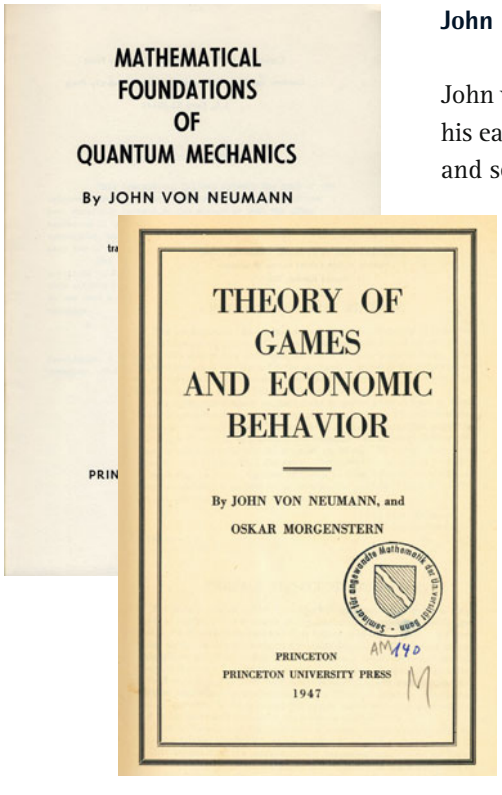
MIT 82 IN DEN TEXT GEDRUCKTEN FIGUREN

LEIPZIG
DRUCK UND VERLAG VON B. G. TEUBNER
1907



Richard von Mises

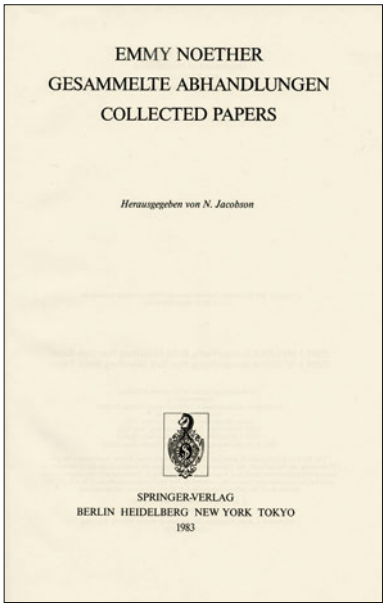
Flight pioneer, founder and director of the first Institute for Applied Mathematics and founder of *Zeitschrift für angewandte Mathematik und Mechanik* [Journal of Applied Mathematics and Mechanics], Richard von Mises made significant contributions to aerodynamics, particularly to the theory of flying, to hydrodynamics and to numerical mathematics. He became particularly well-known for his axiomatic foundation of probability theory, extending the work of Gustav Theodor Fechner and Heinrich Bruns. This theory is based on the idea of understanding "probability" in a random experiment as the limit of the sequence of relative frequencies when the experiment is repeated, provided that a further condition is imposed (which von Mises called the irregularity axiom). This axiom states that this limit must remain unchanged when a subsequence is selected independently of the outcomes of the experiment, that is, as he put it, "without regularity". It sparked a strong debate: initially, the majority of mathematicians rejected von Mises's foundation of probability theory. However, his important contributions to mathematical statistics (the Cramér-von Mises test, the von Mises calculus in non-parametric and robust statistics) are indisputable. His main work, *Wahrscheinlichkeitsrechnung und ihre Anwendungen in der Statistik und Theoretischen Physik* [Probability theory and its applications in statistics and theoretical physics] (1931), is on display. His book *Wahrscheinlichkeit, Statistik und Wahrheit* [Probability, Statistics, and Truth] (1928) also reached a wide audience. Recently, von Mises's understanding of randomness has experienced an unexpected renaissance through the incorporation of methods of algorithm theory and complexity theory.



John (Johann) von Neumann

John von Neumann was one of the leading scientists of the 20th century. In his early works, he made fundamental contributions to mathematical logic and set theory. He then turned to functional analysis, developing the abstract theory of Hilbert space and the spectral theory of self-adjoint operators. He summarized these results in his famous monograph, *Mathematische Grundlagen der Quantenmechanik* [Mathematical Foundations of Quantum Mechanics] (1932). Von Neumann created the foundations for the theory of algebras which are today named after him, introduced the concept of a local convex space and solved the fifth Hilbert problem for compact Lie groups. His elegant introduction of almost periodic functions on groups and his statistical ergodic theorem are important for the wide-ranging developments to which they gave rise. He is also considered one of the most important pioneers of modern computer technology. Furthermore, von Neumann was a founder of game theory. He formulated the strategy concept, proved the fundamental minimax theorem and developed the basics for the theory of *n*-person games. Together with Oskar Morgenstern he wrote the first monograph on game theory, *Theory of Games and Economic Behavior*.

Emmy Noether


EMMY NOETHER
GESAMMELTE ABHANDLUNGEN
COLLECTED PAPERS

Herausgegeben von N. Jacobson

SPRINGER-VERLAG
BERLIN HEIDELBERG NEW YORK TOKYO
1983

To this day Emmy Noether remains the most important female mathematician ever. Under the influence of Hilbert, her early investigations of invariant theory led to the study of differential invariants and their application to questions regarding the general theory of relativity and general field theories. She also made fundamental contributions in the area of general ideal theory (the role of ascending chain condition; axiomatic characterization of ZPI rings) and in the theory of algebras (theory of representations of algebras, cyclic algebras, applications of cross products – which she introduced – and the Brauer-Hasse-Noether theorem). Perhaps of even greater importance than her concrete individual results was her enduring influence on the transition to thinking in abstract terms and toward the axiomatic method, her efforts to abstractly and conceptually grasp the content of various algebraic theories such as elimination theory, ideal theory in algebraic number and function fields, representation theory, class field theory and module theory, to work out mutual relationships and thus to contribute toward synthesis at a higher level and toward economy of thought. She was able to gather a remarkable circle of brilliant students around her who would themselves later go on to become important researchers. On display are Emmy Noether's *Gesammelte Abhandlungen / Collected Papers* (1983).

Max Noether


Die
Entwicklung der Theorie
der algebraischen Functionen
in älterer und neuerer Zeit.

Bericht
erstattet der Deutschen Mathematiker-Vereinigung
von

Dr. A. Brill, Professor an der Universität Tübingen.
und
Dr. M. Noether, Professor an der Universität Erlangen.

Max Noether, the father of Emmy Noether, was one of the leading scholars in the field of algebraic geometry in his time. He was primarily interested in establishing a strict arithmetic foundation for algebraic-geometrical reasoning. He worked out the theory of algebraic space curves, counted all curve families up to the 17th order and made important contributions to the theory of algebraic surfaces. His most famous result consists in formulating the necessary and sufficient conditions for the equation of an algebraic curve which goes through the (finitely many and isolated) intersection points of two algebraic curves $\varphi(x, y) = 0$, $\psi(x, y) = 0$ to take the form $A\varphi + B\psi = 0$ with polynomials $A(x, y)$, $B(x, y)$ (the so-called Noether conditions). These conditions are fulfilled, for instance, if the intersection points of both curves $\varphi = 0$, $\psi = 0$ are not singular points. In collaboration with Alexander Brill, Noether proved the Brill-Noether residual theorem and provided strict proofs for the Riemann-Roch theorem and the theorem for conservation of the genus under birational maps. On display is the report, co-authored with Brill, "Die Entwicklung der Theorie der algebraischen Functionen in älterer und neuerer Zeit" [The development of the theory of algebraic functions in past and recent times], which became a standard work in the algebraic geometry of the time and even today remains an extremely valuable source for studies on the history of algebraic geometry.


VORLESUNGEN
ÜBER ZAHLEN- UND
FUNKTIONENLEHRE
VON
ALFRED PRINGSHEIM
PROFESSOR DER MATHEMATIK
AN DER UNIVERSITÄT MÜNCHEN
ZWEITER BAND
FUNKTIONENLEHRE
LEIPZIG
1925
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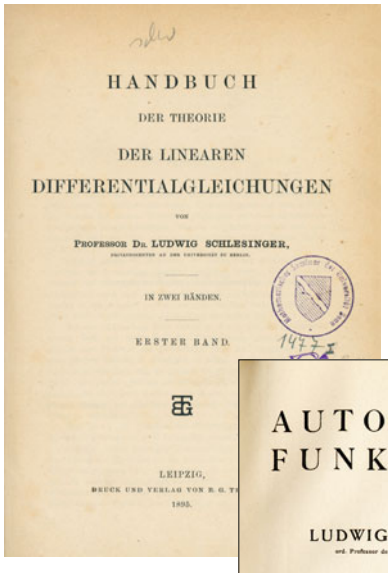
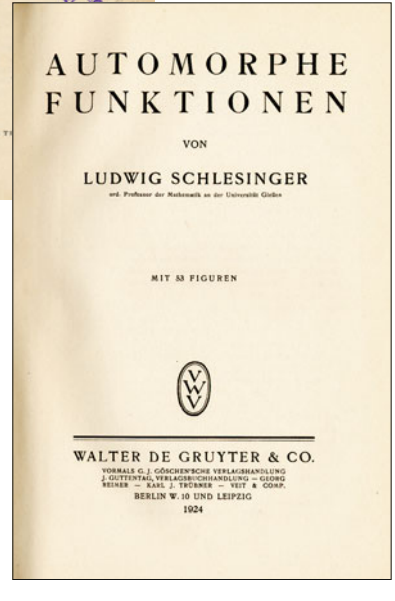
JOHNSON REPRINT CORPORATION
111 Fifth Avenue, New York, N. Y. 10003
JOHNSON REPRINT COMPANY LTD.
Berkeley Square House, London, W. 1

Alfred Pringsheim

Friend and admirer of Richard Wagner as well as Thomas Mann's father-in-law, Alfred Pringsheim turned his house into a hub of intellectual and cultural life in Munich. As a mathematician, he was the most resolute successor of Weierstrass. He was, as it were, the conscience of so-called "Weierstrassian rigor" and in this role did not shy away from polemics. His primary research interest lay in function theory; however, he also worked on continued fractions and Fourier series. His best-known result is the theorem named after him which says that a power series *f(z)* with a radius of convergence *r* has the intersection of its convergence circle with the positive *x*-axis as a singularity if the real parts of all coefficients are positive and the power series formed with these real parts as coefficients has the same convergence radius *r*. For series with positive coefficients this is the Vivanti-Landau theorem. Pringsheim's works on double sequences and double series as well as on entire transcendent functions were quite influential. His surprisingly simple proof of the Cauchy integral theorem became a standard in the literature on function theory. Pringsheim was a beloved and brilliant academic teacher. He published his lectures, five books in total (two volumes in five parts), under the title *Vorlesungen über Zahlen- und Funktionenlehre* [Lectures on the theory of numbers and functions]; volume I, part 3 of the *Vorlesungen* is on display.


HANDBUCH
DER THEORIE
DER LINEAREN
DIFFERENTIALGLEICHUNGEN
VON
PROFESSOR DR. LUDWIG SCHLESINGER,
IN ZWEI BÄNDEN.
ERSTER BAND.
LEIPZIG,

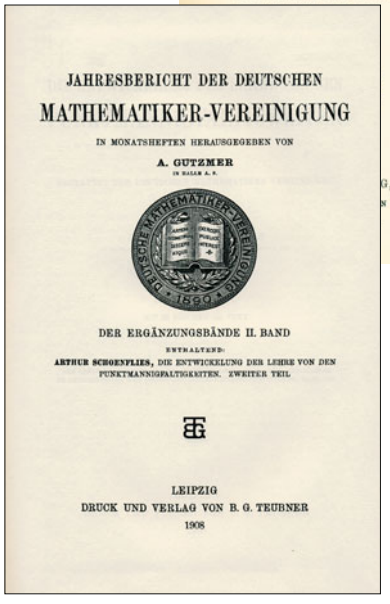

AUTOMORPHE
FUNKTIONEN
VON
LUDWIG SCHLESINGER
MIT 53 FIGUREN
WALTER DE GRUYTER & CO.
BERLIN W. 10 UND LEIPZIG
1924

Ludwig Schlesinger

A student of Fuchs, Ludwig Schlesinger focused mainly on the field of linear differential equations. His two-volume *Handbuch der Theorie der linearen Differentialgleichungen* [Handbook of the theory of linear differential equations] is on display. This encyclopedic work of nearly 1500 pages summarized the already classic results of Euler, Gauss, Cauchy, Jacobi, Riemann and others as well as the more recent findings of Klein, Poincaré, Fuchs, Schlesinger himself and many other mathematicians. Schlesinger also published *Vorlesungen über lineare Differentialgleichungen* [Lectures on linear differential equations] (1908), and in 1909 he prepared a report entitled "Bericht über die Entwicklung der Theorie der linearen Differentialgleichungen seit 1865" [Report on the development of the theory of linear differential equations since 1865] for the German Mathematical Society. His textbook *Automorphe Funktionen* [Automorphic functions] also reached a wide audience. Schlesinger provided a great service in publishing a scientific biography of Gauss and the collected works of his teacher, Fuchs. In the 1920s, he turned to the geometrical problems of the general theory of relativity and took great pains to disseminate the substance of Einstein's theory.

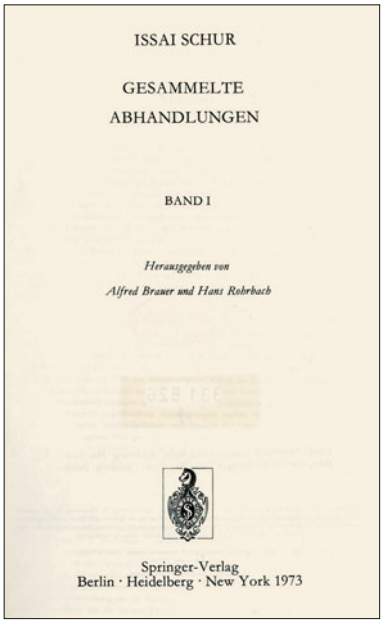
Arthur Schoenflies


KRYSTALLSYSTEME
UND
KRYSTALLSTRUCTUR
VON
DR. ARTHUR SCHOENFLIES,
MIT 73 IN DEN TEXT GEDRUCKTEN FIGUREN.

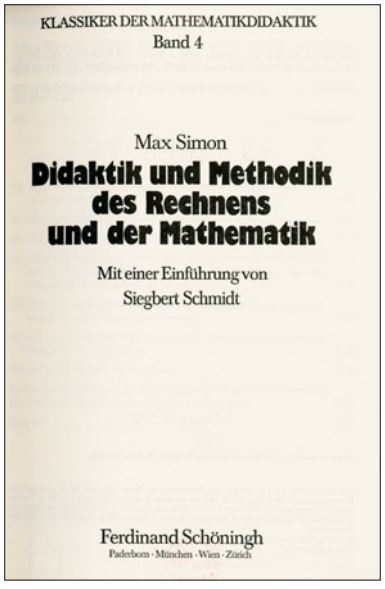

JAHRESBERICHT DER DEUTSCHEN
MATHEMATIKER-VEREINIGUNG
IN MONATSHEFTEN HERAUSGEGEBEN VON
A. GUTZMER
DER ERGÄNZUNGSBÄNDE II. BAND
ENTHALTEND:
ARTHUR SCHOENFLIES, DIE ENTWICKELUNG DER LEHRE VON DEN PUNKTMANNIGFALTIGKEITEN. ZWEITER TEIL
LEIPZIG
DRUCK UND VERLAG VON B. G. TEUBNER
1908

Arthur Schoenflies made important contributions to both pure mathematics (set theory and topology) and applied mathematics (crystallography). His book *Krystallsysteme und Krystallstructur* [Crystal systems and crystal structure] provided the first complete classification of the 230 crystallographic space groups. He also prepared two reports for the German Mathematical Society: "Die Entwickelung der Lehre von den Punktmannigfaltigkeiten" [The development of the theory of point manifolds], Parts I (1900) and II (1908). Schoenflies's reports contributed much toward the reception and popularization of set theory in the period before World War I. These reports were then and remain today a valuable source due to their numerous historical and literary details. The second part also contains a summary of Schoenflies's own results in the context of the Jordan curve theorem, which were certainly far-reaching in their influence. Schoenflies proved that every homeomorphism of a closed Jordan curve C onto the boundary S^1 of the unit disk can be expanded to a homeomorphism of the whole plane to itself which maps the inner area of C onto the inside of S^1 and the external area of C on the external area of S^1. In 1924, after vain attempts at proving this so-called Schoenflies theorem for three-dimensional space as well, James W. Alexander discovered a counter-example, the well-known "horned sphere".

Issai Schur

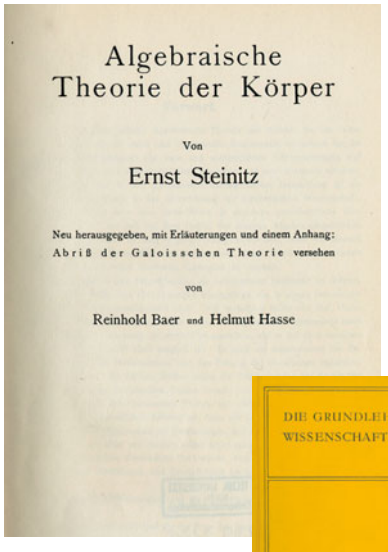

ISSAI SCHUR
GESAMMELTE
ABHANDLUNGEN
BAND I
Herausgegeben von
Alfred Brauer und Hans Rohrbach
Springer-Verlag
Berlin · Heidelberg · New York 1973

Issai Schur is one of the originators of the representation theory of groups, which he had worked on since his dissertation and in connection with work done by Ferdinand Georg Frobenius. He studied representations of the full linear group, of symmetrical and alternating groups, representations through fractional linear substitutions (introducing Schur multipliers) as well as through collineations. He also looked at representations over fields other than that of complex numbers (introducing the Schur index). Essential tools in this work were the lemma named after him – that a matrix which commutes with all matrices of an absolutely irreducible representation must be a multiple of the identity matrix – and the theory of group characters, which he extended substantially. Schur also made significant contributions to the theory of algebraic equations, to matrix and determinant theory, invariant theory, additive, algebraic and analytic number theory, to the geometry of numbers and the theory of continued fractions. Furthermore, he made important additions to the theory of integral equations. Schur was a first-rate academic teacher with a number of important students. On display is volume I of Schur's *Gesammelte Abhandlungen* [Collected papers] which contains, among other things, his early work on representation theory.



Max Simon

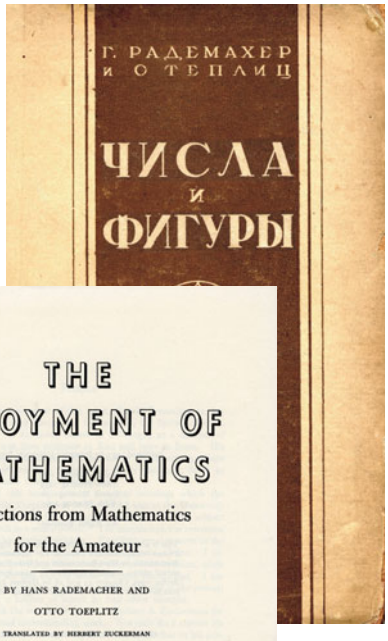
A dedicated teacher, Max Simon taught at secondary schools for 44 years, 40 of them at the Strasbourg Lyceum. He also published a number of works on non-Euclidean geometry, on various issues relating to the history of mathematics and on questions about teaching mathematics, and he authored several textbooks. As part-time professor at the University of Strasbourg, he was one of the first to offer regular lectures on the didactics and methodology of teaching mathematics. Over the course of many semesters, he also gave lectures on the history of mathematics. Probably his most influential work is *Didaktik und Methodik des Rechnens und der Mathematik* [Didactics and methodology of calculation and mathematics]. It contains a wealth of information on the history of mathematics instruction and many issues that remain worthy of consideration, even though his comments on didactics and methods may now be of little more than historical interest. Max Simon never tired of emphasizing the great importance of knowledge of the history of mathematics for the mathematics teacher.

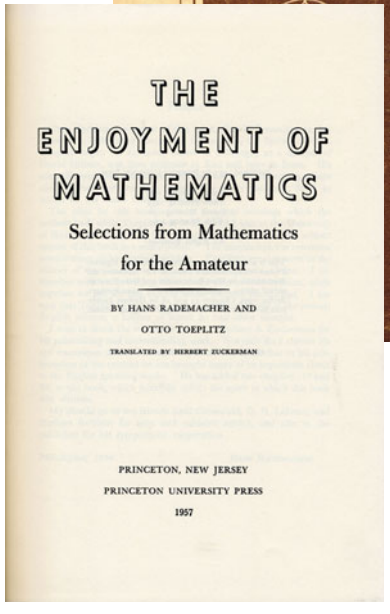


Ernst Steinitz

Ernst Steinitz's primary work is *Algebraische Theorie der Körper* [Algebraic theory of fields], which is on display here. Inspired by Hensel's construction of the *p*-adic number fields, in this work Steinitz set himself the goal of gaining insight into all possible field types on the basis of field axioms. He introduced the concept "characteristic of a field" and, by means of the concept of separable extension, was able to specify the precise boundary of the validity of Galois's theory. Steinitz's theorem that for every field there is (up to equivalence) a unique algebraically closed extension field is of fundamental importance. Furthermore, Steinitz introduced the concept of "degree of transcendence" and proved that every field extension can be decomposed into a pure transcendent expansion and a subsequent algebraic expansion. Steinitz's work was a milestone in the development of modern algebra and, in general, in the development of modern mathematics based on set theory and on systems of axioms. It inspired numerous further studies, particularly those of Artin, Baer, Hasse, Krull and van der Waerden. Steinitz worked on the theory of polyhedra for many years; on the basis of his unpublished papers, Rademacher compiled and published the book *Vorlesungen über die Theorie der Polyeder unter Einschluss der Elemente der Topologie* [Lectures on the theory of polyhedra including elements of topology].

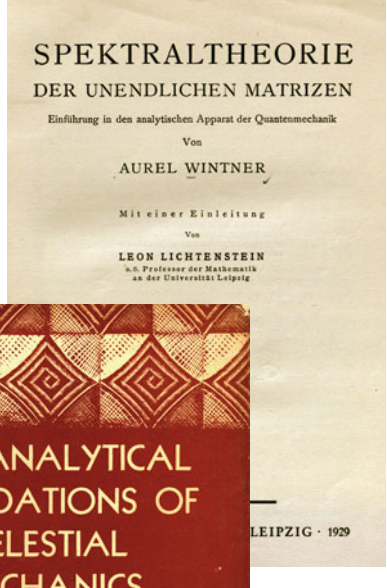
Otto Toeplitz

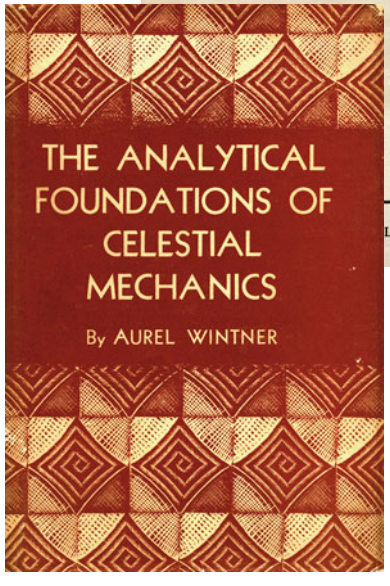




"Über die Fouriersche Entwicklung positiver Functionen" [On the Fourier development of positive functions] (1911), which is probably Otto Toeplitz's most influential work, is a mere one and a half pages long. In it he demonstrates that a real-valued periodic function f is positive if and only if all quadratic forms deriving from its Fourier coefficients are positive-definite. "Toeplitz matrices", or the corresponding operators, play an important role in functional analysis and in applications to partial differential equations, statistical mechanics and X-ray crystallography. Toeplitz's permanence theorem, which states the necessary and sufficient conditions for a limitation process given by an infinite matrix to be consistent, is essential to limitation theory. The results of Toeplitz's work on integral equations and equations with an infinite number of unknowns are included in the encyclopedia article of the same name, which was co-authored by Hellinger; soon after, these results were translated into the language of abstract Hilbert space theory. Toeplitz was heavily involved in teacher training as well as in the popularization of mathematics and its history. The book *Von Zahlen und Figuren* [The Enjoyment of Mathematics. Selections from Mathematics for Amateurs] (1930), co-authored by Rademacher, was translated into several languages; on display are the 1938 Russian edition, which is quite rare, as well as the English edition.

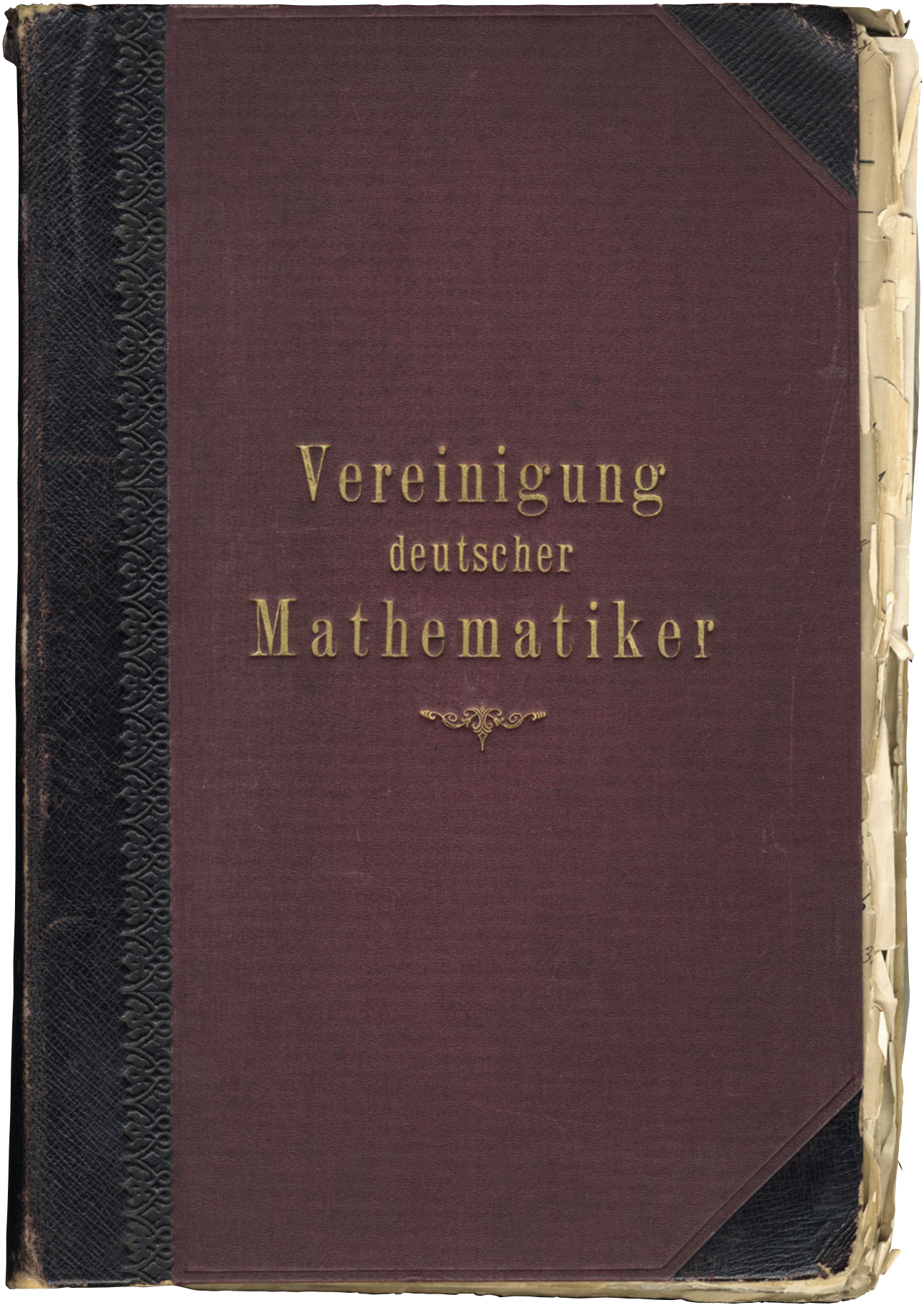
Aurel Friedrich Wintner

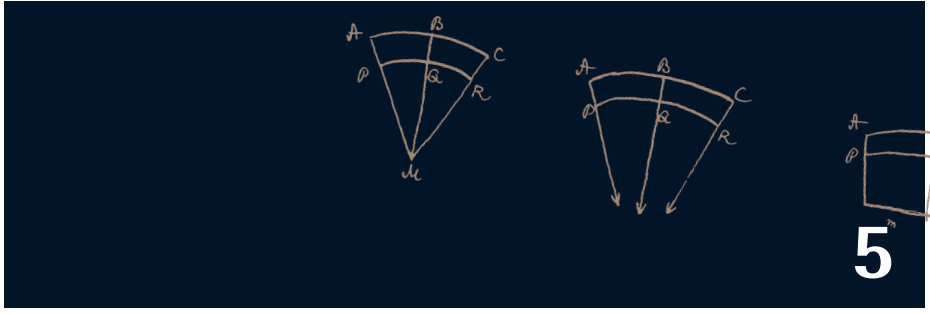




Aurel Wintner was one of Lichtenstein's students. In a series of important papers, he studied Hill's theory of the moon's orbit and provided the first strict proof of the convergence of the Hill method. After studying with Elis Stromgren in Copenhagen, he laid the theoretical basis for the "Stromgren principle" for determining the degeneration of periodic orbits in celestial mechanics. In *Spektraltheorie der unendlichen Matrizen* [Spectral theory of infinite matrices] (1929), he developed fundamental results in Hilbert space theory and provided – simultaneously with but independently of John von Neumann – the first evidence of the spectral representation of unbounded normal operators. A monograph by Wintner, *The Analytical Foundations of Celestial Mechanics*, provides a comprehensive depiction of celestial mechanics. He published many papers, often co-authored by Philip Hartman, on analysis, differential geometry and probability theory in the *American Journal of Mathematics*. He was the journal's editor and, as his colleagues said, "he was the journal". For example, he found sharp asymptotic expansions for the solutions of elliptic equations which play an important role in differential geometry.

Walter Purkert


Vereinigung
deutscher
Mathematiker



5

Book containing the correspondance concerning the foundation of the German Mathematical Society

Professional Commitment

From an early date, Jewish mathematicians also got involved in the organs and organizations of mathematics in Germany – editing leading journals and yearbooks, collaborating with publishing houses such as Julius Springer Verlag and, not least, contributing to the work of the various professional mathematics associations that were established near the end of the 19th century, specifically the *Deutsche Mathematiker-Vereinigung* [German Mathematical Society] and the *Gesellschaft für angewandte Mathematik und Mechanik* [Society for Applied Mathematics and Mechanics].

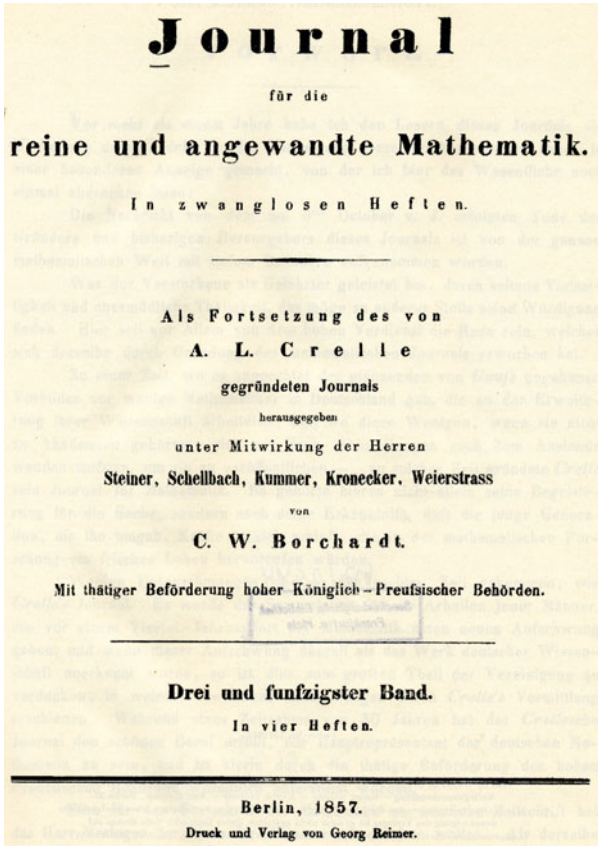
B. Bergmann et al. (eds.), *Transcending Tradition*

Periodicals

The *Journal für die reine und angewandte Mathematik* [Journal for pure and applied mathematics], founded by August Leopold Crelle in 1826, quickly became the most important German language mathematics journal. It published texts by leading Berlin mathematicians such as Jakob Steiner, Ernst Eduard Kummer, Ferdinand Gotthold Eisenstein and Peter Gustav Lejeune Dirichlet, as well as articles by Carl Gustav Jacob Jacobi and Niels Henrik Abel, which boosted the international prestige of Crelle's journal. Following Crelle's death in 1855, Privatdozent Carl Wilhelm Borchardt (1817-1880), who came from a wealthy business family in Berlin, took over as editor of the journal. From then on it was also sometimes called the "Borchardtsche", Borchardt's journal. Borchardt, who had studied with Dirichlet in Berlin and received his doctorate under Jacobi in Königsberg, and who, back in Berlin, was one of Karl Weierstrass's closest friends, occupied this position from Crelle's death until 1880. Like Crelle, Borchardt also viewed the journal as an important instrument for communication among German mathematicians and internationally.

Leon Lichtenstein with Ferdinand Springer. Lichtenstein is third from left, Springer second from left

Leon Lichtenstein (1878-1933), who studied mathematics in Berlin and spent a short period in Münster, held a professorship in Leipzig from 1922 onwards. He had an important group of students there and worked many years as editor of various journals. He was founder and, from 1917 to 1933, editor of *Mathematische Zeitschrift*, published by Springer Verlag. Another member of the journal's editorial board was Issai Schur. From 1919 to 1927, moreover, Lichtenstein was chief editor of *Jahrbuch über die Fortschritte der Mathematik*, which at the time was the only publication that included brief summaries of all German mathematical literature as well as a large part of what was being published internationally in the field of mathematics.



Journal

für die

reine und angewandte Mathematik.

In zwanglosen Heften.

Als Fortsetzung des von

A. L. Crelle

gegründeten Journals

herausgegeben

unter Mitwirkung der Herren

Steiner, Schellbach, Kummer, Kronecker, Weierstrass

von

C. W. Borchardt.

Mit thätiger Beförderung hoher Königlich-Preufsischer Behörden.

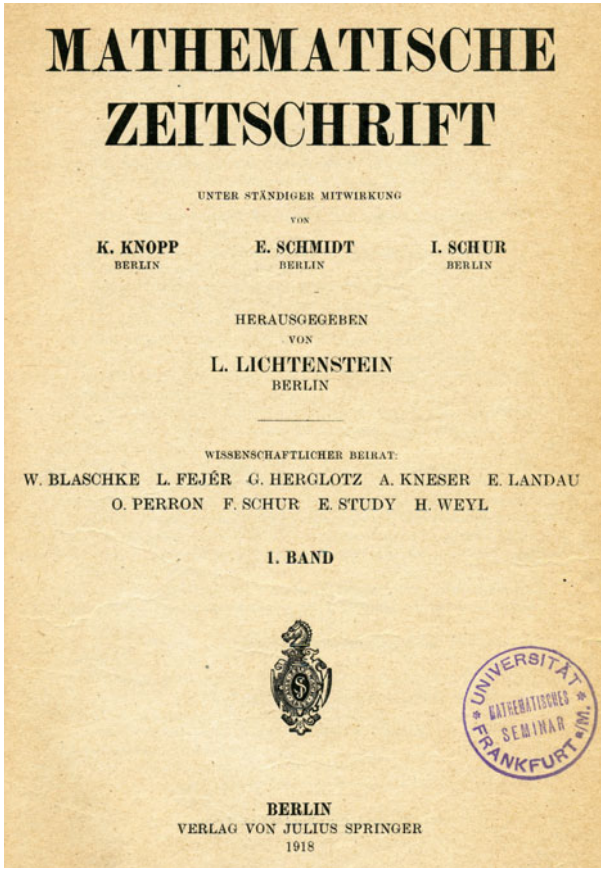
Drei und funfzigster Band.

In vier Heften.

Berlin, 1857.

Druck und Verlag von Georg Reimer.

Cover page of Crelle's *Journal für die reine und angewandte Mathematik*, volume 53, showing Carl Wilhelm Borchardt as editor (1857)



MATHEMATISCHE ZEITSCHRIFT

UNTER STÄNDIGER MITWIRKUNG

VON

K. KNOPP BERLIN · E. SCHMIDT BERLIN · I. SCHUR BERLIN

HERAUSGEGEBEN

VON

L. LICHTENSTEIN

BERLIN

WISSENSCHAFTLICHER BEIRAT:

W. BLASCHKE L. FEJÉR G. HERGLOTZ A. KNESER E. LANDAU

O. PERRON F. SCHUR E. STUDY H. WEYL

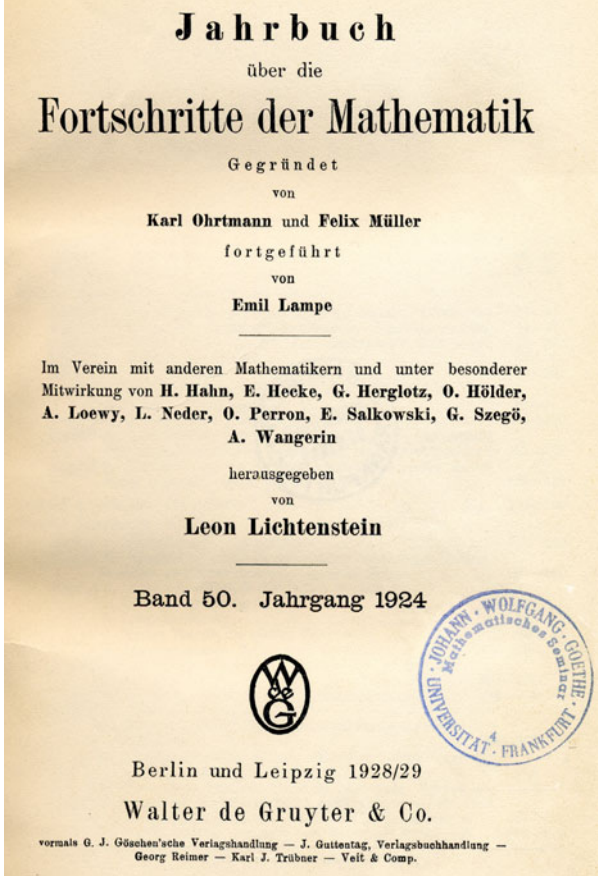
1. BAND

BERLIN

VERLAG VON JULIUS SPRINGER

1918

Cover page of the first volume of *Mathematische Zeitschrift*



Jahrbuch

über die

Fortschritte der Mathematik

Gegründet

von

Karl Ohrtmann und Felix Müller

fortgeführt

von

Emil Lampe

Im Verein mit anderen Mathematikern und unter besonderer Mitwirkung von H. Hahn, E. Heeke, G. Herglotz, O. Hölder, A. Loewy, L. Neder, O. Perron, E. Salkowski, G. Szegö, A. Wangerin

herausgegeben

von

Leon Lichtenstein

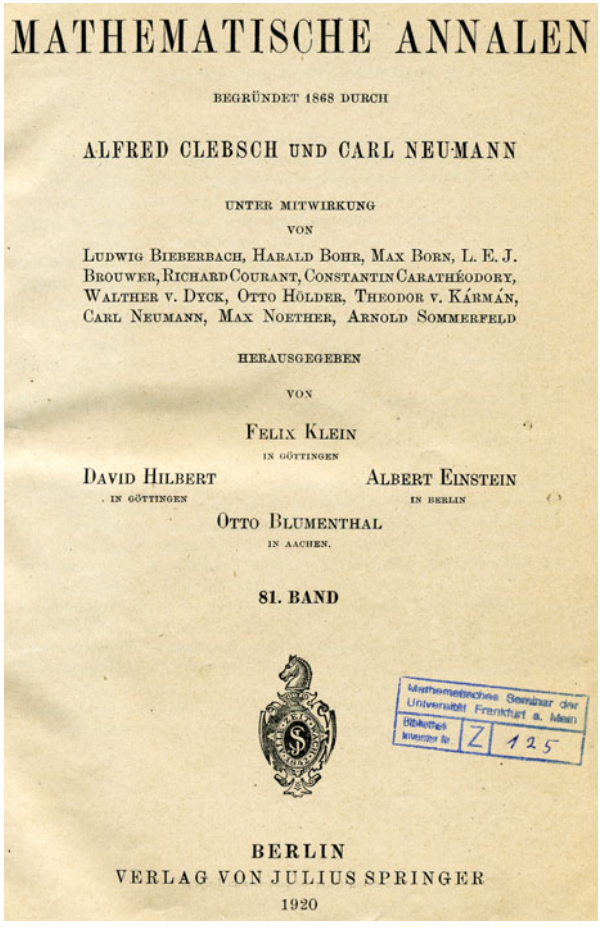
Band 50. Jahrgang 1924

Berlin und Leipzig 1928/29

Walter de Gruyter & Co.

vormals G. J. Göschen'sche Verlagshandlung — J. Guttentag, Verlagsbuchhandlung — Georg Reimer — Karl J. Trübner — Veit & Comp.

Cover page of volume 50 of *Jahrbuch über die Fortschritte der Mathematik*



MATHEMATISCHE ANNALEN

BEGRÜNDET 1868 DURCH

ALFRED CLEBSCH UND CARL NEUMANN

UNTER MITWIRKUNG

VON

LUDWIG BIEBERBACH, HARALD BOHR, MAX BORN, L. E. J. BROUWER, RICHARD COURANT, CONSTANTIN CARATHÉODORY, WALTHER v. DYCK, OTTO HÖLDER, THEODOR v. KÁRMÁN, CARL NEUMANN, MAX NOETHER, ARNOLD SOMMERFELD

HERAUSGEGEBEN

VON

FELIX KLEIN
IN GÖTTINGEN

DAVID HILBERT
IN GÖTTINGEN

ALBERT EINSTEIN
IN BERLIN

OTTO BLUMENTHAL
IN AACHEN.

81. BAND

BERLIN
VERLAG VON JULIUS SPRINGER
1920

Cover page of *Mathematische Annalen,* volume 81

Otto Blumenthal holds a special position in the world of mathematical publishing. He became Hilbert's first doctoral student in 1898 and was a professor at Aachen from 1898 until his dismissal in 1933. From 1905 to 1938 he was managing editor of *Mathematische Annalen*, his last professional activity. Founded in 1868 by Alfred Clebsch, the *Annalen* had by then already developed into the most important publication for mathematicians connected with Göttingen, and it competed directly with Crelle's journal. In the Weimar era, the *Annalen* published several important essays contributed by members of the network surrounding David Hilbert. Even Albert Einstein served as one of the journal's editors. The greatest share of the burden of the editorial work, however, lay not on the shoulders of its renowned editor-in-chief Hilbert but – as everyone knew – on Blumenthal.

Otto Blumenthal in later years

Beginning in 1924, Blumenthal assumed yet another editorial duty: he became editor of the annual report of the German Mathematical Society, *Jahresbericht der DMV*. He fled to the Netherlands in July 1939; that same year his name was removed from the title page of *Mathematische Annalen*. Following the German occupation of the Netherlands, Blumenthal fell into the hands of the Nazis. He perished in the Theresienstadt concentration camp in 1944.[1]

1 More information on Otto Blumenthal can be found in the essay "On stage and behind the scenes in Göttingen" in this volume.

Hilbert 30

561

Prof. O. Blumenthal
Aachen, Beseler-Str.

Aachen, den 11.11.1933.

E. Möller
Speiser
Fischer
Weblen Princ. 2
Bieberbach
v. Neumann

Lieber Herr Professor!

Ich muß Ihnen mein Herz wegen der Annalen ausschütten. Bevor ich aber anfange, bestätige ich Ihnen sehr verspätet den Eingang Ihres Manuskriptes über die Grundlagen des Denkens, das wieder einmal ein Schmuck der Annalen sein wird. Ich werde es sogleich in Satz geben.

Ich halte die Lage der Annalen für gefährdet. Einen kleinen Teil der Gefahr sehe ich in meiner eigenen Lage. Mein Name war nie besonders zugkräftig. Ich bezweifle erst recht, daß er jetzt, wo er der eines entlassenen jüdischen Professors ist, auf Autoren anziehend wirken wird. Ich konstatiere auch seit einigen Monaten eine ganz auffällige Abnahme der Zahl der bei mir direkt einlaufenden Manuskripte. 94

Eine größere Gefahr sehe ich in den allgemeinen Umständen und in der Lage der Göttinger mathematischen Fakultät.

Was die allgemeinen Verhältnisse betrifft, so habe ich mich zunächst davon überzeugt, daß die Redaktion der Annalen von dem Schriftleitergesetz nicht betroffen wird, denn dieses bezieht sich nur auf solche Zeitschriften, die einen politischen Inhalt haben. Daß aber bei den oberen Stellen durchaus der Wille besteht, auch auf die wissenschaftlichen Zeitschriften einzuwirken, zeigt Stark's Rede in Würzburg. Auch haben kürzlich bindende Vereinbarungen zwischen dem Hochschulverband und dem Buchhändler-Börsenverein stattgefunden, die gewisse Mißstände bei den medizinischen und naturwissenschaftlichen Zeitschriften beseitigen wollen (sie sind in einer "Bekanntmachung" veröffentlicht worden). Es handelt sich dabei hauptsächlich um die sogen. "aufgeblähten" Zeitschriften (die immer dicker und dicker geworden sind), die sich zu einer Reduktion ihres Umfanges durch strengere Auswahl des Materials verpflichten mußten. Auch diese Bekanntmachung geht die Annalen nicht unmittelbar an, denn wir haben unseren Umfang seit 30 Jahren kaum vermehrt, auch glaube ich, daß die Strenge der Stoffauswahl nicht angezweifelt werden kann. Aber sowohl Stark's Drohung wie auch diese Bekanntmachung haben eine deutliche Spitze gegen Springer. Es ist also durchaus möglich,

Letter from Otto Blumenthal to David Hilbert, 11 November 1933

daß man aus diesem Grunde die Annalen schärfer beobachtet und versuchen wird sie zu hemmen, wozu die zahlreichen bei uns veröffentlichten ausländischen Arbeiten und der nicht arische Redakteur einen Vorwand geben könnten.

Auf der anderen Seite werden die Annalen bedroht durch Brouwer's neugegründete Compositio Mathematica, in der ja ein zahlenmäßig sehr großer Stab internationaler Mitarbeiter vereinigt ist. Da Bieberbach und Feigl diesem Stabe angehören, ist klar, daß wir für die Annalen auf Mitarbeit der Berliner Schule nicht zu hoffen haben. Bedenklicher ist, daß auch Heinz Hopf-Zürich, mit dem wir immer gut zusammengearbeitet haben, diesem Konkurrenzunternehmen zugesagt hat.

Die allergrößte Gefahr aber liegt in dem ungewissen Schicksal der Göttinger Mathematik. Das ist die Quelle, aus der wir gespeist werden. Wenn Göttingen verödet oder mit Professoren besetzt wird, die aus der Tradition heraustreten, dann müssen wir uns ganz neue Quellen erschliessen oder wir gehen zugrunde. Dadurch, daß Emmy Noether weggegangen ist, ist bereits eine empfindliche Lücke entstanden. Und was mit Courant werden wird, läßt sich wohl noch nicht voraussehen.

Ich möchte Ihnen deshalb zu erwägen geben, ob Sie nicht den bisher verfolgten Grundsatz einer möglichst kleinen Redaktion wieder aufgeben und eine mäßige Erweiterung ins Auge fassen wollen. Ein für die Annalen günstiges Moment ist der Tod Lichtensteins. Dadurch könnten wir uns die Leipziger Schule erschliessen, in der ja Gutes gemacht wird. Mein Vorschlag ist der, van der Waerden, der sich schon seit mehreren Jahren durch schnelle und gründliche Begutachtung um uns sehr verdient gemacht hat, offiziell in die Redaktion aufzunehmen. Er ist ungewöhnlich vielseitig und u.a. anerkannter Meister in Algebra und Topologie, also zwei besonders wichtigen Gebieten. Ich habe mit van der Waerden natürlich noch nicht über meine Idee korrespondiert, weiß also auch nicht wie er sich dazu stellen würde. Er scheint mir nur sachlich der weitaus geeignetste zu sein, und, so viel ich weiß, stehen ihm auch vom persönlichen und politischen Gesichtspunkte aus keine Bedenken entgegen.

Ich komme noch einmal auf meine eigene Stellung bei den Annalen zurück und möchte in dem, was ich jetzt schreibe, ja nicht mißverstanden werden. Ich halte es für meine Pflicht Ihnen mein Amt zur Verfügung zu stellen, falls Sie finden, daß meine Abstammung oder meine unklare Lage als entlassener Pro-

† Indem ich den Absatz nochmals überlese, sehe ich, daß allen meinen Bemühungen trotz mir die Möglichkeit eines Missverständnisses. Sie könnten vielleicht aus meinen Worten einen Vorwurf, den ich Ihnen machen gegen Sie herauslesen. Das liegt mir natürlich gänzlich fern. Ich weiß, daß Sie mich bei den knappen Zeiten nicht reden, wenn es gilt. Aber ich bitte Sie zu prüfen, ob es gilt.

fessor oder irgend etwas anderes an mir dem Ansehen oder der Wirksamkeit der Annalen schaden könnte.† Ich halte es für meine Pflicht Ihnen dies zu sagen, und ich werde ohne Empfindlichkeit zurücktreten, wenn Sie es für angezeigt halten. Sie werden mich aber auch richtig verstehen, wenn ich zufüge, daß es mich schmerzen wird die Tätigkeit aufzugeben, denn - abgesehen davon, daß bei meinen durch die Pensionierung auf etwa die Hälfte verminderten amtlichen Einnahmen die Annaleneinkünfte von etwa 100 Mark pro Monat eine recht wesentliche Stütze meines Budget bilden - beruht doch mein ganzes Ansehen in der wissenschaftlichen Welt wesentlich auf meiner Redakteurtätigkeit. Ich hänge deshalb sehr daran, aber ich klebe nicht daran: Das habe ich Ihnen sagen wollen und, wenn es im Interesse der Annalen liegt, werde ich zurückzutreten verstehen.

Ich habe Ihnen noch über einen finanziellen Punkt zu berichten. Bisher wurden von dem von Springer gezahlten Annalenhonorar (30 Mark pro Bogen) 4 Mark pro Bogen abgezweigt, die unser hiesiger ~~Ordinarius~~ Extra-Ordinarius Krauss für Durchsicht der Korrekturen erhielt. Nachdem jetzt meine Einkünfte so geschmälert sind, habe ich mit Zustimmung meines Freundes Krauss das Lesen der Revision wieder selbst übernommen und die 4 Mark pro Bogen mir selbst von Springer vergüten lassen. Hierzu erbitte ich die Genehmigung der Redaktion.

Hiernach noch einiges persönliche das erfreulicher ist. Maly ist entschieden gebessert wenn auch noch schonungsbedürftig. Unser neues Häuschen ist sehr gelungen, und wir leben da ganz idyllisch. Ich versuche mir neue Arbeitsgebiete in Funktionen mehrerer Veränderlicher und altgriechischer Mathematik aufzutun.

Einen Durchschlag dieses Briefes schicke ich an Hecke. Ich bitte Sie um recht baldige und gründliche Antwort, denn die Dinge machen mir wirklich Sorge.

Beste Grüße von Haus zu Haus.

Ihr

O. Blumenthal.

Prof. O. Blumenthal

Aachen, 11 November 1933

Aachen, Beserterstr

E. Nöther
Speiser
Fueter
Veblen, Princeton?
Birkhoff
v. Neumann

Dear Professor!

I need to unburden my heart to you on the topic of the Annalen. But before I begin, please accept my belated confirmation of receipt of your manuscript about the foundations of thought, which will once again be a true gem in the Annalen. I will have it typeset immediately.

In my opinion, the Annalen are in danger. A small part of this danger I consider to be my own situation. My name has never been one to draw particular interest. And now, as it has become the name of a dismissed Jewish professor, I doubt even more that it can attract authors. In recent months, I have also noticed a striking decrease in the number of manuscripts submitted directly to me.

But a much greater danger, in my opinion, is the general situation and the conditions at the Göttingen mathematical faculty.

With regard to the general situation, I have first of all verified that the editing of the Annalen will not be affected by the law for editors, as it applies only to journals that have political content. Stark's Würzburg speech, however, does show that those in power are willing to influence scientific journals as well. Recently, binding agreements have also been concluded between the Academic Association and the German Publishers and Booksellers Association to rectify certain grievances concerning journals of medicine and natural sciences (they have been made public in an "announcement"). This concerns mostly the so-called "puffed-up" journals (which have become more and more inflated), which had to agree to reduce their girth by applying stricter control of their material. This announcement does not directly affect the Annalen either, as we have barely increased our volume during the past 30 years, and I believe our rigor in controlling our material is hardly to be doubted. But Stark's threat and this announcement are clearly pointed at Springer. It is therefore possible, that for this purpose the Annalen will be observed much more closely and that attempts will be made to impede them. The numerous contributions from abroad and the non-Aryan editor could be used as a pretext for this.

From another point of view, the Annalen are threatened by Brouwer's newly-founded Compositio Mathematica, which has a large international staff. As Bieberbach and Feigl are also members of this staff, it is clear that we may not hope for any contribution to the Annalen from the Berlin school. Even more alarming is the fact that Heinz Hopf-Zürich, with whom we have always enjoyed great cooperation, has agreed to cooperate with this competing enterprise.

The gravest danger, however, lies in the uncertain fate of Göttingen mathematics. This is the source that feeds us. If Göttingen is made desolate, or if all positions are filled with professors who leave the tradition, then we need to tap wholly new sources, or we perish. The fact that Emmy Noether has left has already created a tangible gap. And it is not yet foreseeable what will happen to Courant.

I would therefore like to ask you to ponder whether you might want to abandon the previously held principle of keeping the editorial team as small as possible, and to consider a moderate enlargement. An aspect which may be beneficial for the Annalen is Lichtenstein's death. This could allow us to link up with the Leipzig school, where good work is done. My suggestion is to officially include van der Waerden, who has rendered great services to us by speedy and thorough reviewing during the past years, in the editorial board. He is unusually versatile, and among his other qualities he is a recognized master of algebra and topology, two very important fields. Of course I have not yet corresponded with van der Waerden about this idea, and I therefore do not know his position on this. He simply seems to be the most suited, and, as far as I know, there seem to be no objections against him from a personal or political point of view.

Let me return to my own role in the Annalen, and I do not want to be misunderstood in what I am writing now. I consider it my obligation to resign from my position, should you think that my ancestry or my uncertain situation as a dismissed university professor or anything else related to my person could damage the reputation or the efficacy of the Annalen. * I consider it to be my obligation to say this to you, and I will resign without hurt feelings if you think this advisable. But please understand me correctly if I add that giving up this work will cause me pain, since – not considering the fact that now that after my retirement my income has been reduced by half, the income of approximately 100 marks generated by the *Annalen* is a significant addition to my budget – my reputation in the scientific world rests essentially on my editing activities. I therefore value them highly, but do not intend to hold onto them: this is what I wanted to tell you, and, if you consider it best for the *Annalen*, I will certainly know how to resign.

But there is another financial matter which I need to report to you. Until now, 4 marks per sheet were deducted from the fee paid by Springer (30 marks per sheet) to be passed on to our local Extraordinarius Krauss for reviewing the corrections. Now that my income has been so severely reduced, I have decided, after consultation with my friend Krauss, to resume reviewing myself and to keep the 4 marks per sheet provided for this by Springer. For this, I request permission from the editorial board.

And finally, a bit of personal and more enjoyable news. Mali has improved significantly but still needs rest. Our new little home is very convenient, and we live there in quite idyllic conditions. I am trying to open up new areas of study in [the theory of] functions with several variables and in ancient Greek mathematics.

I will send a copy of this letter to Hecke. I would like to ask you to answer soon, and comprehensively, as I am very concerned about all this.

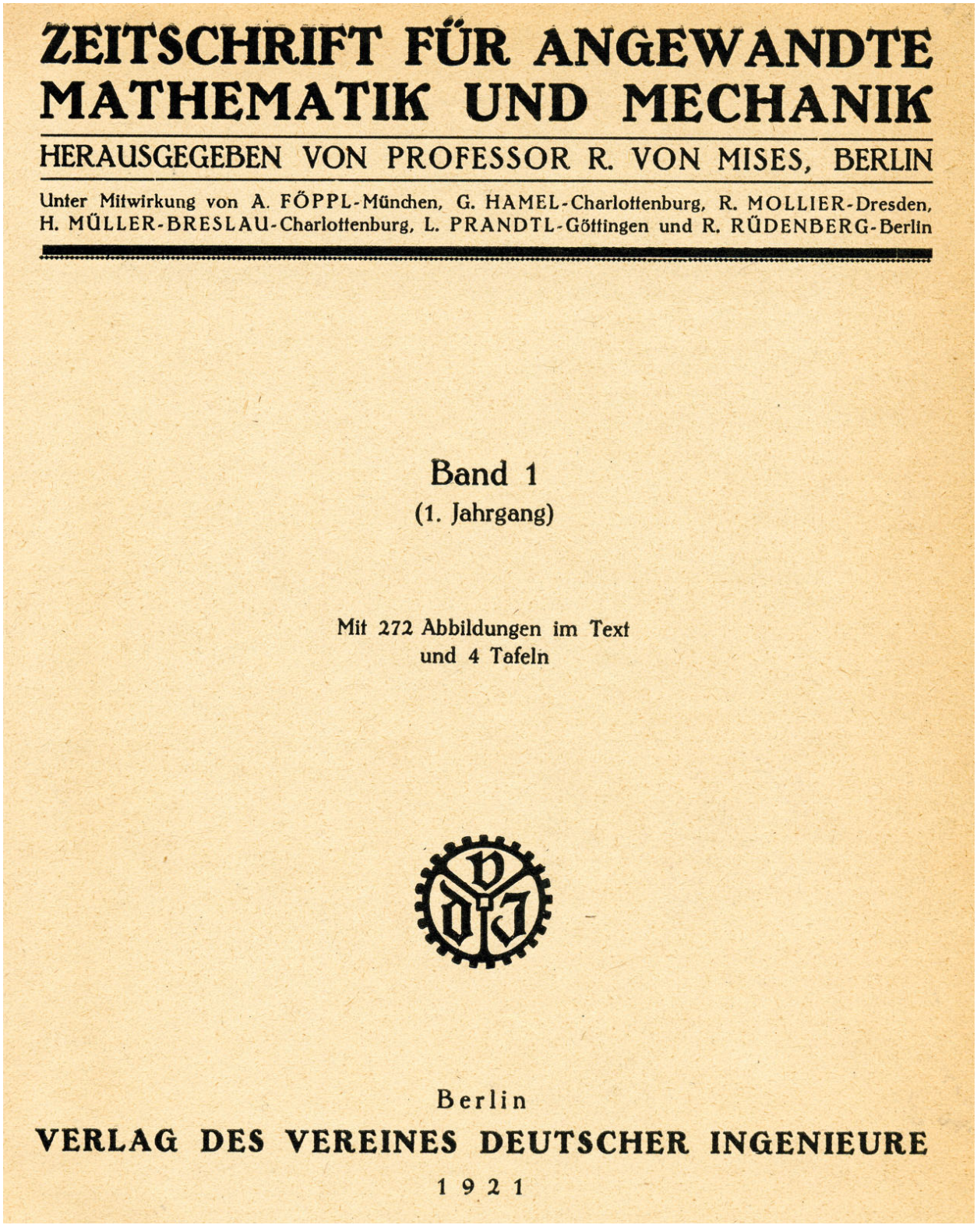
Best wishes, from house to house

Yours,
O. Blumenthal

[Handwritten remarks in margin:]

* In rereading this paragraph, I see that despite all my efforts the possibility of a misunderstanding still exists. You might read into my words an accusation against you or distrust of you. Naturally, I mean nothing of the sort. I know that you will keep me on the staff of the Annalen if it is in any way possible. But I ask you to look into whether it is indeed possible.

In the field of applied mathematics, Richard von Mises assumed an important role as editor of *Zeitschrift für angewandte Mathematik und Mechanik* (ZAMM), which was founded in 1921. In the introductory article "Über die Aufgaben und Ziele der angewandten Mathematik" [On the tasks and goals of applied mathematics] in the first volume, he sketched out his vision of the rapidly expanding field. Von Mises, too, was forced to give up editing the journal when he emigrated in 1933.


ZEITSCHRIFT FÜR ANGEWANDTE MATHEMATIK UND MECHANIK

HERAUSGEGEBEN VON PROFESSOR R. VON MISES, BERLIN

Unter Mitwirkung von A. FÖPPL-München, G. HAMEL-Charlottenburg, R. MOLLIER-Dresden, H. MÜLLER-BRESLAU-Charlottenburg, L. PRANDTL-Göttingen und R. RÜDENBERG-Berlin

Band 1
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Mit 272 Abbildungen im Text
und 4 Tafeln

Berlin
VERLAG DES VEREINES DEUTSCHER INGENIEURE
1921

Cover page of the first volume of *Zeitschrift für angewandte Mathematik und Mechanik* (ZAMM)

Collaboration with the Springer publishing house

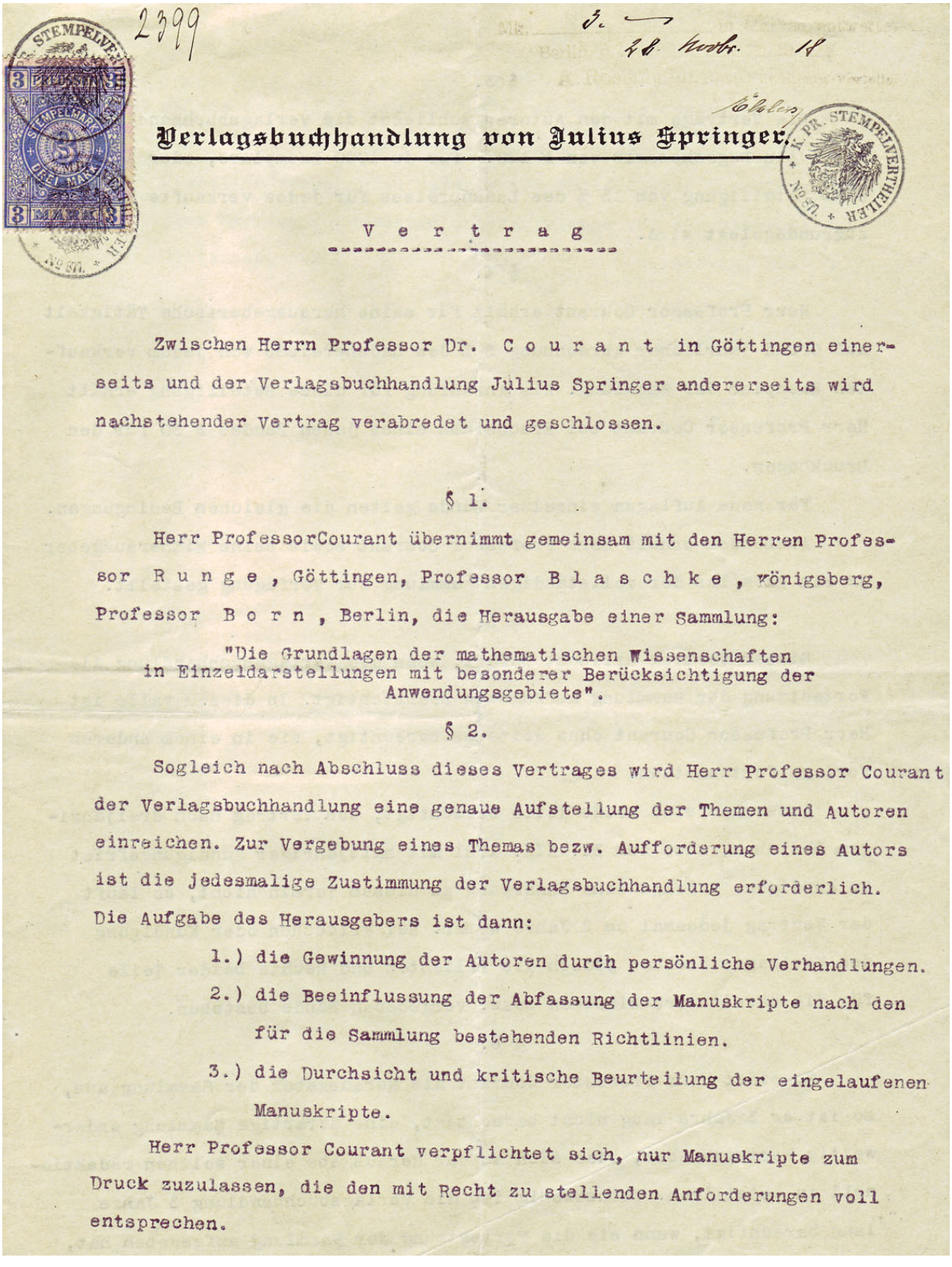
Springer Verlag, an academic publishing house founded and run by a Jewish family from Berlin, played an important role in the advancement of mathematics during the Weimar period.[2] The publishing house, which was initially active in the fields of political science and philosophy, developed from a bookstore founded by Julius Springer in Berlin in 1842 and soon turned into a scientific and academic institution publishing in a number of fields. Julius Springer's grandson Ferdinand Springer (1881-1965), who began to assume leadership duties at the publishing house in 1907, was particularly interested in mathematics. At the end of World War I he began transforming Springer Verlag into a leading publishing house for mathematical literature beyond the borders of Germany. This international orientation contributed greatly to making German-language mathematical literature known worldwide during the Weimar era, and as a result the success of the publishing house and the mathematicians themselves had a mutually reinforcing effect.

Ferdinand Springer

Richard Courant

Ferdinand Springer always relied on close collaboration with mathematics advisors who not only provided guidance regarding potential publications but also established contacts with authors.[3] If at first Lichtenstein, the founder of *Mathematische Zeitschrift*, was Springer's most important partner in the field of mathematics, Richard Courant in Göttingen soon took over this role. In November 1918, Courant and Springer came to an agreement on the publication of what was to become the extraordinarily successful "Yellow Series": *Die Grundlehren der mathematischen Wissenschaften* (known today as "A Series of Comprehensive Studies in Mathematics"). Many important monographs were published in this series in the following years.

2 See (Remmert; Schneider 2010).
3 For more on the following, see (Remmert; Schneider 2008).



2399

28 Oktbr. 18

Berlin

Verlagsbuchhandlung von Julius Springer.

K. PR. STEMPELVERTHEILER

V e r t r a g

Zwischen Herrn Professor Dr. C o u r a n t in Göttingen einerseits und der Verlagsbuchhandlung Julius Springer andererseits wird nachstehender Vertrag verabredet und geschlossen.

§ 1.

Herr ProfessorCourant übernimmt gemeinsam mit den Herren Professor R u n g e , Göttingen, Professor B l a s c h k e , Königsberg, Professor B o r n , Berlin, die Herausgabe einer Sammlung:

"Die Grundlagen der mathematischen Wissenschaften in Einzeldarstellungen mit besonderer Berücksichtigung der Anwendungsgebiete".

§ 2.

Sogleich nach Abschluss dieses Vertrages wird Herr Professor Courant der Verlagsbuchhandlung eine genaue Aufstellung der Themen und Autoren einreichen. Zur Vergebung eines Themas bezw. Aufforderung eines Autors ist die jedesmalige Zustimmung der Verlagsbuchhandlung erforderlich. Die Aufgabe des Herausgebers ist dann:

1.) die Gewinnung der Autoren durch persönliche Verhandlungen.
2.) die Beeinflussung der Abfassung der Manuskripte nach den für die Sammlung bestehenden Richtlinien.
3.) die Durchsicht und kritische Beurteilung der eingelaufenen Manuskripte.

Herr Professor Courant verpflichtet sich, nur Manuskripte zum Druck zuzulassen, die den mit Recht zu stellenden Anforderungen voll entsprechen.

First page of the contract between Ferdinand Springer and Richard Courant on the *Grundlehren* [Basic theories] publication, 28 November 1918

Publishing House of Julius Springer

C O N T R A C T

The contract below is hereby agreed and concluded between Professor Dr. Courant (Göttingen) and the Julius Springer publishing house:

§ 1

In cooperation with Professors Runge (Göttingen), Blaschke (Königsberg) and Born (Berlin), Professor Courant shall undertake the edition of a series titled: "Die Grundlagen der mathematischen Wissenschaften in Einzeldarstellungen mit besonderer Berücksichtigung der Anwendungsgebiete" [Basic theories of mathematical sciences in monographs with particular attention to fields of application].

§ 2

Immediately following the conclusion of the present contract, Professor Courant shall provide the publishing house with a detailed list of topics and authors. Allocation of topics and requests to authors shall require confirmation of the publishing house in each individual case.
The editor shall then:

1.) obtain the cooperation of the authors by way of personal negotiation.
2.) influence the writing of the manuscripts according to the guidelines applying to the series.
3.) revise and critically assess the manuscripts submitted to him.

Professor Courant undertakes to submit only such manuscripts for printing that have complied in full with the justifiable demands.

kript eines den Gegenstand allgemein interessierenden betreffenden Aufsatzes von Polya einschicken, so bald ich wieder in Göttingen bin.

Inzwischen bin ich mit besten Grüssen

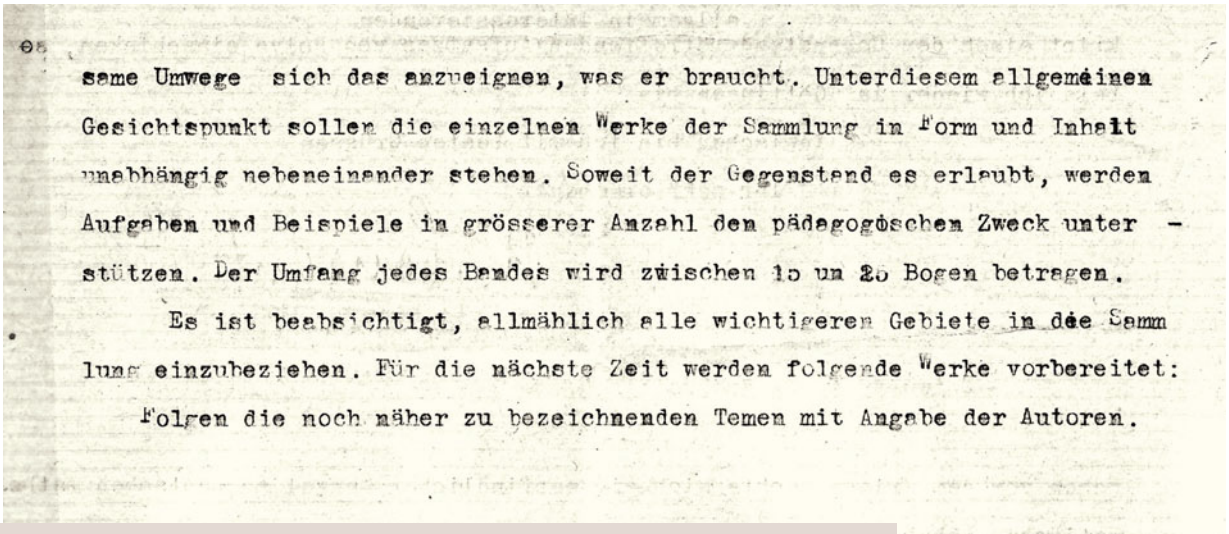
Ihr sehr ergebener

R. Courant

Entwurf zu Rundschreiben.

Schon vor dem Kriege machte sich ein empfindlicher Mangel an Deutschen mathematischen Lehrbüchern fühlbar, welche weniger den Charakter von Monogrsphien tragen, sondern den pädagogischen Zweck voranstellen, die Leser mit ohne Umwege und ohne unnötige Pedanterie mit den wesentlichen Gedanken einer mathematischen Disziplin vertraut zu machen; ebenso vermisste der Leser, der nicht ausschliesslich reiner Mathematiker war, häufig die Aufzeigung der Zusammenhänge zwischen dem mathematischen Stoff und den Anwendungen, er lernte nicht von den Wegen und Brücken, die von der einen Seite zur andern führen. Diesen Bedürfnissen will die vorliegende Sammlung entgegen kommen. Sie wendet sich an einen weiteren Leserkreis, der nicht nur an die Studierenden der Mathematik, sondern ebenso an die Physiker, die wissenschaftlich gerichteten Ingenieure, die Chemiker, kurz an alle, welche sich mathematische Gedanken und Methoden als Selbstzweck oder als Hilfsmittel aneignen wollen. Unter Wahrung mathematischer Strenge, jedoch unter Verzicht auf pedantisches Streben nach bloss formaler grösstmöglicher Allgemeinheit um jeden Preis und ähnlichen D Dingen, welche so oft die Erfassung einfacher und wichtiger Grundgedanken für den Leser erschweren, sollen dem Mathematiker die Hauptideeen seiner Wissenschaft zugleich mit dem Bewusstsein von den mannigfachen Beziehungen und Wechselwirkungen vermittelt werden, welche zwischen so vielen mathematischen Disziplinen und den Anwendungen bestehen, und andererseits s soll dem Physiker usw. der Stoff in einer Weise dargeboten werden, welche d dem Lernenden wirklich erleichtert, ohne unnötige müh-

Letter from Richard Courant to Ferdinand Springer, 30 January 1919. Courant included in the letter the draft of a circular letter regarding the *Grundlehren* series



same Umwege sich das anzueignen, was er braucht. Unterdiesem allgemeinen Gesichtspunkt sollen die einzelnen Werke der Sammlung in Form und Inhalt unabhängig nebeneinander stehen. Soweit der Gegenstand es erlaubt, werden Aufgaben und Beispiele in grösserer Anzahl den pädagogischen Zweck unterstützen. Der Umfang jedes Bandes wird zwischen 15 un 20 Bogen betragen.

Es ist beabsichtigt, allmählich alle wichtigeren Gebiete in die Sammlung einzubeziehen. Für die nächste Zeit werden folgende Werke vorbereitet:

Folgen die noch näher zu bezeichnenden Temen mit Angabe der Autoren.

Draft of circular letter

Before the war there was already a pronounced lack of German textbooks, specifically works which were less monographic in nature but more suited to the pedagogical purpose of acquainting readers directly and without unnecessary pedantry with the essential characteristics of a mathematical discipline. Readers who were not exclusively pure mathematicians were also often not given adequate examples for grasping the connections between the mathematical topics and the applications; they were not made familiar with the ways and bridges leading from one side to the other. The collection at hand aims to alleviate this situation. It addresses a wider circle of readers, not only students of mathematics but also physicists, scientifically-oriented engineers, chemists, in short all those who need to familiarize themselves with mathematical thinking and methods, either as a purpose unto itself or as a tool. Maintaining mathematical rigor, but foregoing all pedantic pursuit of merely formal but excessive generality at all costs and other such things which so often keep the reader from understanding simple and important basic principles, the collection aims to impart to the mathematician the primary ideas of his science, together with an awareness of the manifold relationships and mutual effects that exist between so many mathematical disciplines and their applications. On the other hand, it hopes to present the material to physicists etc. in a way that truly makes it easier for a learner to appropriate whatever he needs, without unnecessary detours. On the basis of this general approach, the individual chapters of the collection are intended to be independent of each other in form and content. In as far as the subject allows for this, a large number of problems and examples will support the teaching purpose. Each volume will be between 15 and 20 full sheets of paper.

The intention is to gradually incorporate all important areas into the collection. The following issues are currently being prepared: To be followed by the topics, which are yet to be defined in greater details, together with the names of the authors.

Springer also published several journals, such as *Mathematische Zeitschrift* and *Mathematische Annalen*, the rights to which the publishing house acquired in 1920. Through Courant, Göttingen mathematicians in particular enjoyed a very close connection to Springer, as evidenced by the congratulatory letter (see p. 176) from Göttingen professors to Ferdinand Springer on the occasion of the honorary doctorate awarded to him in 1930.

Die Grundlehren der mathematischen Wissenschaften

in Einzeldarstellungen

mit besonderer Berücksichtigung der Anwendungsgebiete. Gemeinsam mit **W. Blaschke**, Hamburg, **M. Born**, Göttingen, **C. Runge†**, Göttingen, herausgegeben von

R. Courant, Göttingen

Verlag von
Julius Springer
Berlin

Ausgegeben im April 1929

Publishing prospectus advertising the "Gelbe Reihe" [Yellow Series]

Die Grundlehren der mathematischen Wissenschaften

Übersicht über die bisher erschienenen Bände

(Die mit * bezeichneten Bände sind im Laufe der Jahre 1928 und 1929 erschienen)

Verlag von Julius Springer / Berlin

athematisches Institut
der Universität

Göttingen, den 30. Januar 1930
Bunsenstraße 3/5

Herrn

Dr. Ferdinand Springer

Berlin W 9.
Linkstr. 23/24.

Lieber Herr Springer!

Sie wissen ja seit langem, wie hoch wir Göttinger Mathematiker Ihre Tätigkeit für die mathematische Wissenschaft einschätzen. Hätten Sie nicht nach dem Kriege in Ihrer grosszügigen und weit ausblickenden Art sich in die Bresche gestellt, so wäre der mathematischen Literatur in Deutschland durch das Versagen anderer Verleger ein tödlicher Schlag versetzt worden, der auch auf die Wissenschaft als solche unheilvolle Auswirkungen hätte haben müssen.

Schon zu Lebzeiten von Klein und Runge bestand unter den Mathematikern der einmütige Wunsch, Ihnen die Anerkennung Ihrer Tätigkeit in einer äusserlich sichtbaren Form auszusprechen. Es freut uns daher heute ganz besonders, dass unsere mathematisch-naturwissenschaftliche Fakultät sich dem Votum der Mathematiker angeschlossen hat. Sie verleiht Ihnen in einem Diplom, das wir gleichzeitig an Sie zur Absendung bringen, die Würde eines Ehrendoktors.

Wir hoffen sehr, dass Ihnen diese wohlverdiente Auszeichnung Freude und Genugtuung bereitet und wünschen Ihnen als unserm jüngsten Ehrendoktor von Herzen Glück.

Mit freundlichen Grüssen.

R. Courant D. Hilbert.
E. Landau. G. Herglotz.

Congratulatory letter to Ferdinand Springer on the occasion of his honorary doctorate from the University of Göttingen

Mathematical Institute
of the University

Göttingen, 30 January 1930
Bunsenstrasse 3/5

Dr. Ferdinand Springer
Berlin W9
Linkstr. 23/24

Dear Mr. Springer!

You have been aware for a long time how highly we Göttingen mathematicians value your activities for mathematical science. If you, in your generous and foresighted disposition, hadn't stepped into the breach after the war, the failure of other publishers would have resulted in a deathly blow to mathematical literature, which would also have affected science as such.

Already in the lifetime of Klein and Runge, there existed among mathematicians the unanimous wish to acknowledge your activities in a visible form. Today we are therefore extremely pleased that our faculty for mathematics and the natural sciences has joined the mathematicians' vote. In a certificate, which we have concurrently sent off to you, they have awarded to you the title of Honorary Doctor.

We do hope that this well-deserved distinction is a source of pleasure and satisfaction for you. Heartfelt best wishes to our youngest Honorary Doctor.

Best regards:

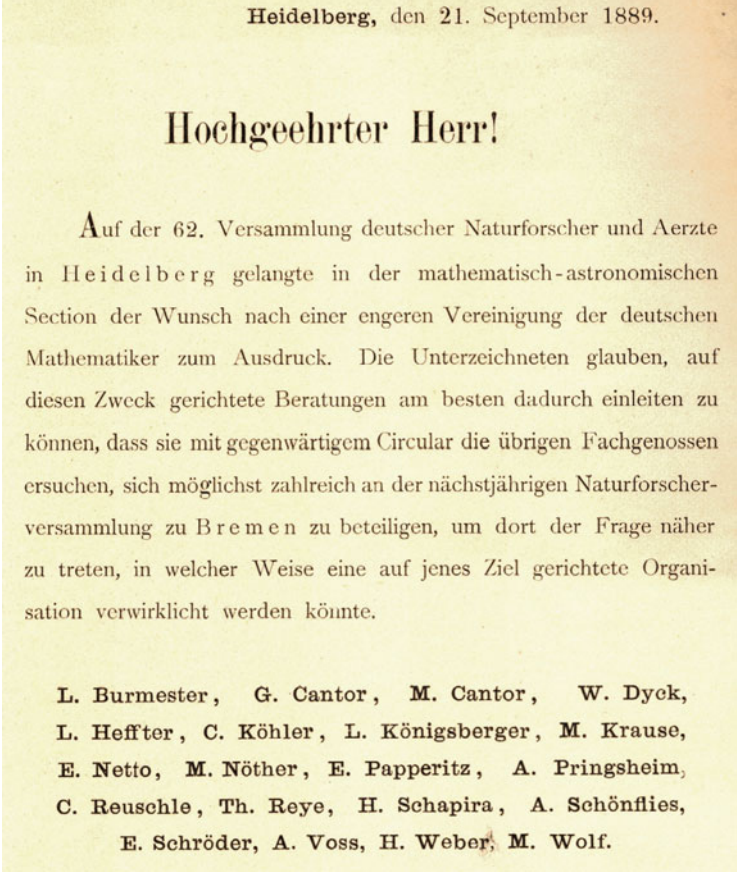
R. Courant D. Hilbert

E. Landau G. Herglotz

The German Mathematical Society and the Society for Applied Mathematics and Mechanics

The German Mathematical Society [*Deutsche Mathematiker-Vereinigung* – DMV] was founded largely due to the initiative of the Halle mathematician Georg Cantor. Cantor, author of the theory of transfinite sets, had Jewish ancestors on the paternal side; his father, however, had been baptized.[4] Jewish mathematicians were active in the DMV from the start: the petition calling for its foundation, which was circulated at the annual meeting of the Association of German Natural Scientists and Physicians in Heidelberg in 1889, included the signatures of Moritz Cantor, Leo Königsberger, Max Noether, Alfred Pringsheim, Hermann Schapira and Arthur Schoenflies. Many of these scientists also participated in the correspondence which led to the establishment of the organization in 1890 and which is preserved in its correspondence records. In a letter to Georg Cantor, Leopold Kronecker – who had been invited to give the opening lecture on Ferdinand Gotthold Eisenstein at the founding assembly in Bremen in 1890 but was unable to attend – outlined his conception of the goals of a "free association" in the "true republic of scholars" of mathematics. Several Jewish mathematicians served as presidents of the association (before 1933 most served terms of only a year). After the founding president, Georg Cantor, the list includes Paul Gordan, Max Noether, Alfred Pringsheim, Kurt Hensel, Edmund Landau, Arthur Schoenflies, Otto Blumenthal and Hans Hahn. After assuming editorial duties for *Jahresbericht der DMV* [Annual report of the German Mathematical Society], Blumenthal became a permanent board member of the Society – until 1933.

Heidelberg petition for the establishment of the DMV, 1889



Heidelberg, den 21. September 1889.

Hochgeehrter Herr!

Auf der 62. Versammlung deutscher Naturforscher und Aerzte in Heidelberg gelangte in der mathematisch-astronomischen Section der Wunsch nach einer engeren Vereinigung der deutschen Mathematiker zum Ausdruck. Die Unterzeichneten glauben, auf diesen Zweck gerichtete Beratungen am besten dadurch einleiten zu können, dass sie mit gegenwärtigem Circular die übrigen Fachgenossen ersuchen, sich möglichst zahlreich an der nächstjährigen Naturforscherversammlung zu Bremen zu beteiligen, um dort der Frage näher zu treten, in welcher Weise eine auf jenes Ziel gerichtete Organisation verwirklicht werden könnte.

L. Burmester, G. Cantor, M. Cantor, W. Dyck,
L. Heffter, C. Köhler, L. Königsberger, M. Krause,
E. Netto, M. Nöther, E. Papperitz, A. Pringsheim,
C. Reuschle, Th. Reye, H. Schapira, A. Schönflies,
E. Schröder, A. Voss, H. Weber, M. Wolf.

4 See (Tapp 2005: 156-159).

Heidelberg, 21 September 1889

Highly honored Sir!

During the 62nd meeting of the Association of German Natural Scientists and Physicians in H e i d e l b e r g, the mathematical-astronomical section expressed the wish for a closer association of the German mathematicians. The signatories believe that the best way to commence consultations for that purpose is to request the remaining expert colleagues with this current circular to participate, in large numbers, in next year's natural scientists' assembly in B r e m e n, in order to approach the question of how to implement an organization which aims at achieving the above.

L. Burmester, G. Cantor, M. Cantor, W. Dyck,
L. Heffter, C. Köhler, L. Königsberger, M. Krause,
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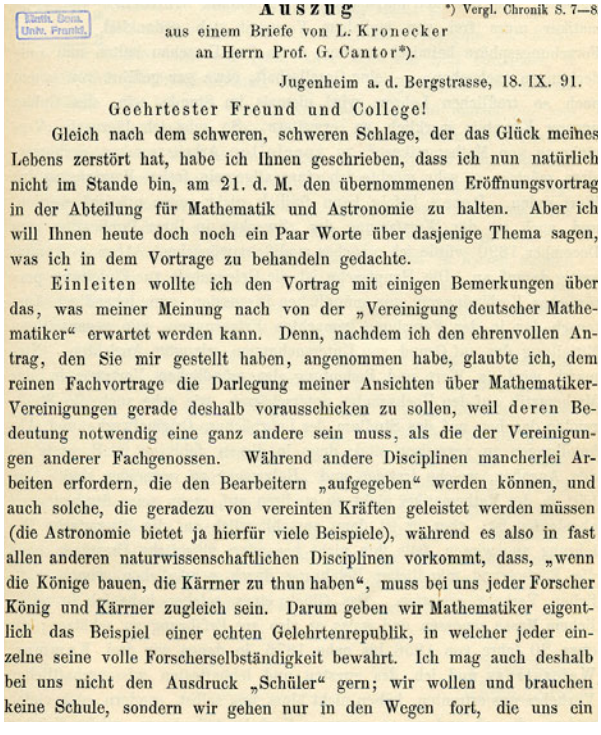


Auszug *) Vergl. Chronik S. 7—8

aus einem Briefe von L. Kronecker
an Herrn Prof. G. Cantor*).

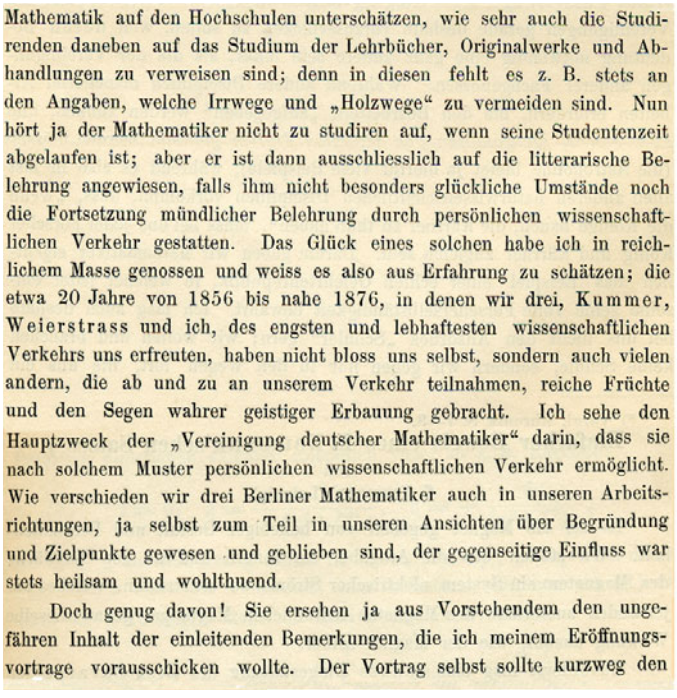
Jugenheim a. d. Bergstrasse, 18. IX. 91.

Geehrtester Freund und College!

Gleich nach dem schweren, schweren Schlage, der das Glück meines Lebens zerstört hat, habe ich Ihnen geschrieben, dass ich nun natürlich nicht im Stande bin, am 21. d. M. den übernommenen Eröffnungsvortrag in der Abteilung für Mathematik und Astronomie zu halten. Aber ich will Ihnen heute doch noch ein Paar Worte über dasjenige Thema sagen, was ich in dem Vortrage zu behandeln gedachte.

Einleiten wollte ich den Vortrag mit einigen Bemerkungen über das, was meiner Meinung nach von der „Vereinigung deutscher Mathematiker" erwartet werden kann. Denn, nachdem ich den ehrenvollen Antrag, den Sie mir gestellt haben, angenommen habe, glaubte ich, dem reinen Fachvortrage die Darlegung meiner Ansichten über Mathematiker-Vereinigungen gerade deshalb vorausschicken zu sollen, weil deren Bedeutung notwendig eine ganz andere sein muss, als die der Vereinigungen anderer Fachgenossen. Während andere Disciplinen mancherlei Arbeiten erfordern, die den Bearbeitern „aufgegeben" werden können, und auch solche, die geradezu von vereinten Kräften geleistet werden müssen (die Astronomie bietet ja hierfür viele Beispiele), während es also in fast allen anderen naturwissenschaftlichen Disciplinen vorkommt, dass, „wenn die Könige bauen, die Kärrner zu thun haben", muss bei uns jeder Forscher König und Kärrner zugleich sein. Darum geben wir Mathematiker eigentlich das Beispiel einer echten Gelehrtenrepublik, in welcher jeder einzelne seine volle Forscherselbständigkeit bewahrt. Ich mag auch deshalb bei uns nicht den Ausdruck „Schüler" gern; wir wollen und brauchen keine Schule, sondern wir gehen nur in den Wegen fort, die uns ein Lehrer oder Vorgänger geebnet und gewiesen hat, wenn wir meinen, auf diesen Wegen weitere Ziele erreichen zu können. „Wir wollen und brauchen keine Schule", weil in unserer absolut klaren Wissenschaft jede neue Entdeckung die bisherige Schulweisheit wertlos machen kann. Das hat uns ja die Geschichte unserer Wissenschaft oft genug gezeigt. Wir können deshalb aber auch durchaus nichts Förderliches von einer in der Weise „gemeinsamen Arbeit" erwarten, die — wie die andern Disciplinen — sich mit speciellen Thematen beschäftigt. Im Gegenteil, solcherlei Arbeit kann nur den Fortschritt der Mathematik hindern. Der Mathematiker muss frei von jeglichem Vorurteil sich gedanklich in seiner Forschungssphäre heimisch machen, darin frei Umschau halten und Entdeckungen nachgehen; — eine Gesellschaft, etwa gar geführt von einem noch so trefflichen Lehrer, wird niemals im Stande sein, das Gebiet unserer Kenntnis merklich zu erweitern. So sehr ich hiernach „Vereinigung von Mathematikern" zu speciellen Arbeitszwecken perhorresciren möchte, so sehr möchte ich einer allgemein freien Vereinigung das Wort reden. Deren Erfolg kann freilich nicht genau präcisirt werden, und auch an der Wortfassung der „Zwecke" in Ihrer Publication vom December 1890 würde ich manches modificirt wünschen. Aber es kommt wenig darauf an. Die Hauptsache ist die Gelegenheit zur Einleitung persönlicher Verbindungen, zur mündlichen Discussion, zum lebendigen Austausch der in der Forschung gemachten Erfahrungen, zur gegenseitigen Mitteilung der auf Grund von Untersuchungen erlangten Ansichten. Niemand wird ja Wert und Bedeutung der mündlichen Vorträge in der

Excerpt of a letter from Leopold Kronecker to Georg Cantor, 18 September 1891



Mathematik auf den Hochschulen unterschätzen, wie sehr auch die Studirenden daneben auf das Studium der Lehrbücher, Originalwerke und Abhandlungen zu verweisen sind; denn in diesen fehlt es z. B. stets an den Angaben, welche Irrwege und „Holzwege“ zu vermeiden sind. Nun hört ja der Mathematiker nicht zu studiren auf, wenn seine Studentenzeit abgelaufen ist; aber er ist dann ausschliesslich auf die litterarische Belehrung angewiesen, falls ihm nicht besonders glückliche Umstände noch die Fortsetzung mündlicher Belehrung durch persönlichen wissenschaftlichen Verkehr gestatten. Das Glück eines solchen habe ich in reichlichem Masse genossen und weiss es also aus Erfahrung zu schätzen; die etwa 20 Jahre von 1856 bis nahe 1876, in denen wir drei, Kummer, Weierstrass und ich, des engsten und lebhaftesten wissenschaftlichen Verkehrs uns erfreuten, haben nicht bloss uns selbst, sondern auch vielen andern, die ab und zu an unserem Verkehr teilnahmen, reiche Früchte und den Segen wahrer geistiger Erbauung gebracht. Ich sehe den Hauptzweck der „Vereinigung deutscher Mathematiker“ darin, dass sie nach solchem Muster persönlichen wissenschaftlichen Verkehr ermöglicht. Wie verschieden wir drei Berliner Mathematiker auch in unseren Arbeitsrichtungen, ja selbst zum Teil in unseren Ansichten über Begründung und Zielpunkte gewesen und geblieben sind, der gegenseitige Einfluss war stets heilsam und wohlthuend.

Doch genug davon! Sie ersehen ja aus Vorstehendem den ungefähren Inhalt der einleitenden Bemerkungen, die ich meinem Eröffnungsvortrage vorausschicken wollte. Der Vortrag selbst sollte kurzweg den Titel haben „Ueber Eisenstein“ oder auch „Zum Gedächtnis von Eisenstein“. Ich wollte darin nur ganz kurz über die Zeit berichten, in der ich mit ihm persönlich bekannt war, auch einige Briefe wissenschaftlichen Inhalts, die ich von ihm besitze, mitteilen und danach — wie etwa in einer Gedenkrede — über seine Arbeiten sprechen. Dabei müssten dann ausser den rein arithmetischen und analytisch-arithmetischen noch ganz besonders seine rein analytischen Untersuchungen über elliptische Functionen hervorgehoben werden, welche dem Bewusstsein der Jeztzeit ganz abhanden gekommen sind, auf welche ich aber bei meinen neuesten Arbeiten habe zurückkommen müssen. Jetzt in diesen meinen Arbeiten haben sich die eigentlichen Ursachen der „Unebenheiten“ gefunden, welche Eisenstein in seiner Theorie — wie sich deutlich erkennen lässt — unangenehm aufgefallen sind. Auch hierauf wollte ich näher eingehen. Ich hoffe, die Ausarbeitung des ganzen Vortrags, für den ich bis jetzt nur einige vorläufige Aufzeichnungen gemacht habe, noch durchführen zu können. Falls dies geschieht, kann der Vortrag vielleicht, wenn es Ihnen und der mathematischen Abteilung, welcher Sie präsidiren, angemessen erscheint, mit den wirklich gehaltenen Vorträgen (unter Hinzufügung einer geeigneten Vorbemerkung) gedruckt werden. Auch stelle ich Ihnen anheim, aus diesem Briefe, soviel Sie davon für geeignet halten, der mathematischen Abteilung auszugsweise mitzuteilen. Jedenfalls bitte ich, meine collegialischen Grüsse in einer der Verhandlungen auszurichten und dabei meinem tiefen Bedauern Ausdruck zu geben, dass ich durch mein Unglück am persönlichen Erscheinen verhindert bin. . . .

*) Compare Chronicle pp. 7-8.

Excerpt
of a letter written by L. Kronecker
to Professor G. Cantor*)

Jugenheim upon Bergstrasse, 18 September 1891

My esteemed friend and colleague!
Immediately after the grievous, grievous blow that ruined my life's happiness, I wrote to you that I was, at the moment, certainly not able to deliver the opening lecture I had undertaken to deliver on the 21st of this month in the department of mathematics and astronomy. Nevertheless, let me communicate today a few words to you regarding the topic which I had intended to address in my lecture.
I had planned to commence the lecture with several comments on what I believe may be expected from the "Society of German Mathematicians". For, after having accepted your honorable request I believed that, before starting my purely technical lecture, I should present my views on associations of mathematicians, not least because theirs must necessarily be a completely different meaning than that of associations of other experts. Whilst other disciplines require various tasks to be "assigned" to those working on them, and also tasks that are predestined to be accomplished with joint efforts (indeed, astronomy provides numerous examples for this), whilst, after all, it happens in all other scientific disciplines that "when the kings are building, the carters have work to do", in our discipline all research scientists have to be both king and carter. This is why we mathematicians actually constitute the model of a true republic of scholars where each individual retains his full autonomy as a research scientist. I therefore dislike using the expression "disciple" in our realm; we do not want nor need a school, we

only follow the paths paved or indicated by a teacher or predecessor when we think that we can achieve further objectives by following them. "We do not want nor need a school" because in our clear-cut science any new discovery may render worthless the previous book learning. This has indeed been manifested all too often in the history of our science. Nor can we expect, therefore, anything conducive to be derived from a manner of "shared work" which, as in other disciplines, focuses on specific topics. On the contrary, such work cannot but hinder the progress of mathematics. Free of any bias, the mathematician must focus his thought on his own scientific sphere, free to explore it and to pursue discoveries; – an association, even one led by an ever so splendid teacher, will never be able to noticeably widen our sphere of knowledge. Accordingly, as much as I should abominate an "association of mathematicians" for special work purposes, all the more so should I like to put the case for a general and free association. The success of such a group may not, however, be specified exactly, and I would also wish to make a number of modifications in the wording of the "purposes" in your publication of December 1890. However, this is not essential. The main point is the chance to initiate personal relations, oral discussion, a vivid exchange of research experiences and mutual communication of views gained through research. Indeed, no one will underestimate the value and importance of oral lectures in mathematics at universities, as much as the students also need to be referred to the study of textbooks, original works and treatises; indeed, these publications constantly lack information on how to avoid going down the wrong tracks or "barking up the wrong trees". The mathematician, however, does not cease studying when his student days are over; however, he is then exclusively dependent on literary instruction, unless particularly fortunate circumstances allow him to continue oral instruction in personal academic communication. I bounteously enjoyed such good fortune and thus appreciate it from experience; the 20 or so years from 1856 to nearly 1876, where the three of us, Kummer, Weierstrass and myself, enjoyed mutual association in the closest and liveliest of scholarly exchanges, were most fruitful and not only brought the blessing of true intellectual edification to ourselves but also to many others who from time to time participated in our exchanges. I see the principal purpose of the "Society of German Mathematicians" in facilitating personal scientific communication by following this kind of model. As different as we three Berlin mathematicians may have been and continue to be in the direction of our work and even partly in our views on principles and goals, the mutual influence was always pleasant and beneficial.

However, enough of that! You may certainly see from my preceding words the rough content of the preliminary remarks that I wanted to make in advance of my opening lecture. The lecture itself was to have the simple title "About Eisenstein" or "In remembrance of Eisenstein". Therein I meant only to quickly report on the time when we personally knew each other and talk about some of his more scientific letters which I have in my possession, and after that – such as in a commemorative speech – speak about his work. It would have been necessary to particularly emphasize not only his purely arithmetic and analytic-arithmetic contributions but also, and particularly so, his purely analytic research on elliptic functions, which has been

completely lost in the awareness of our present time, but to which I have had to return in my most recent works. These works of mine uncover the real causes of the "unevenness" which – and this may be clearly perceived – had made such a negative impression on Eisenstein in his own theory. I would also have liked to deal with this in more detail. I still hope to be able to prepare the entire lecture, for which I have so far made only some preparatory notes. Were I to manage to do so, and if it seems adequate to you and to your mathematical department, the lecture might be printed together with the lectures that are actually given (with a suitable preliminary remark). I also leave it to your discretion to notify the mathematical department of this letter in excerpts, as much as you deem suitable. In any case, I beg you to convey my collegial greetings in one of the proceedings and thereby to give utterance to my deep regret that owing to my misfortune I am prevented from appearing in person. [...]

Göttingen, 3 July [18]90

Dear Professor,

First of all, I ask you to forgive me for waiting so long with my reply concerning the foundation of a mathematical association. I wanted to consult with Professor Klein before responding, but during our last meetings I did not have a chance to raise the topic. Professor Klein has meanwhile informed me of your correspondence and the state of affairs.

As I have heard, most of the gentlemen have expressed a preference for not severing our ties with the general Association of German Natural Scientists and Physicians. Although this would seem recommendable on first consideration, for me the objective should still be to become independent of the Association of German Natural Scientists and Physicians. It might even be questionable whether within the new and more strictly organized association we would be given the flexibility and freedom of determination that is in any case desirable. Cf. section 17 of the new statutes.

Furthermore, it would also seem desirable and advantageous to me if in addition to the above-mentioned tasks, which the association would possibly need to handle, we were to retain the opportunity, as we have had so far, to lecture on our own research topics.

I remain, with the kindest of regards,

Most respectfully yours,
Dr A. Schoenflies

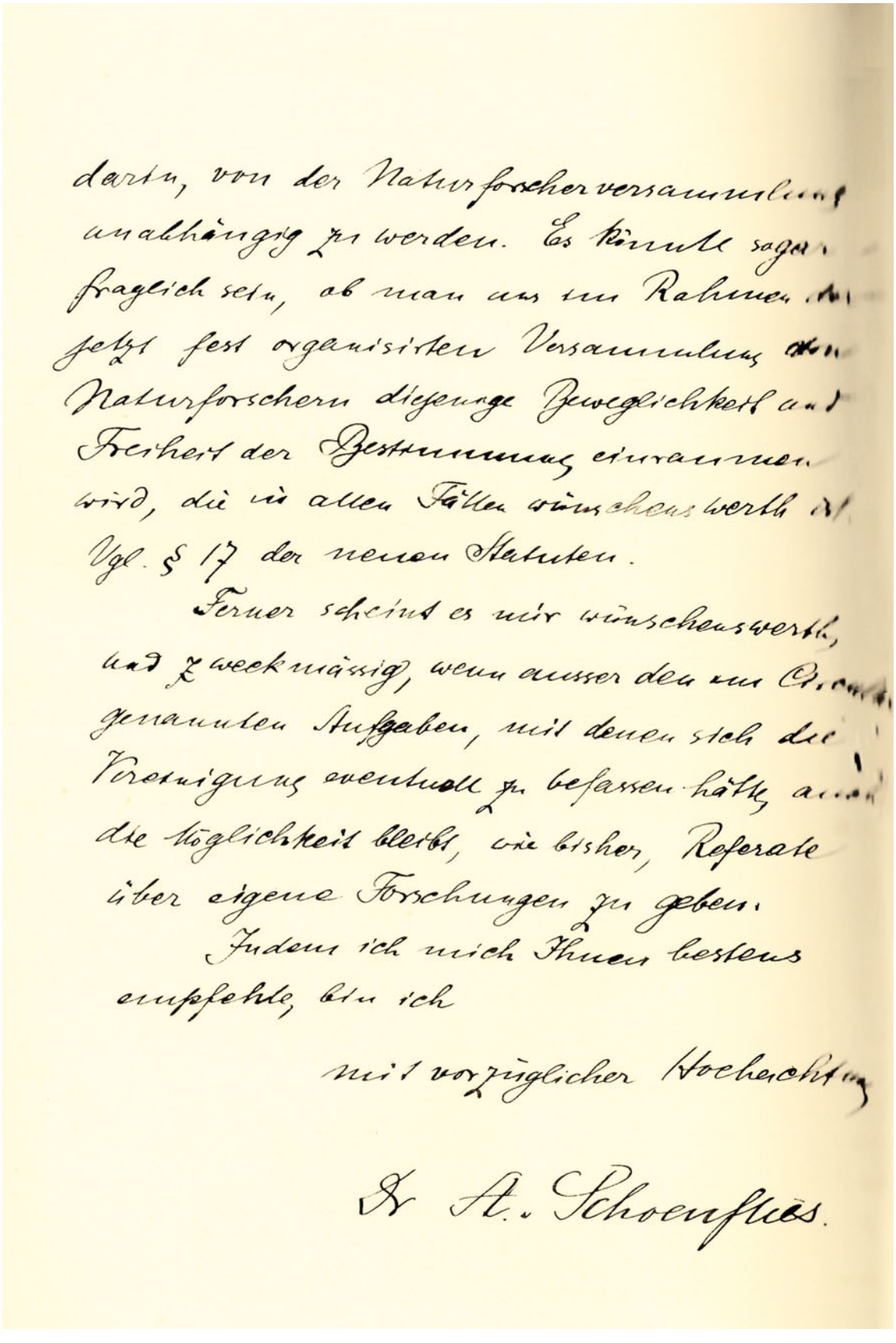
Letter from Arthur Schoenflies to Georg Cantor, 3 July 1890

Göttingen 3/7. 90

Sehr geehrter Herr Professor,

Ich bitte Sie zunächst vielmals um Entschuldigung, daß ich Ihnen erst heute bezüglich der zu gründenden Mathematiker-Vereinigung Antwort sende. Ich wünschte zuvor mit Prof. Klein Rücksprache zu nehmen, was leider bei den letzten Tagen unseres Zusammentreffens nicht dazu kommen können. Inzwischen bin ich nun von Prof. Klein über Ihren Briefwechsel und den Stand der Sache unterrichtet worden.

Wie ich höre, haben sich die meisten Herren dahin ausgesprochen, die Verbindung mit der allgemeinen Naturforscherversammlung nicht zu lösen. Wenn sich dies für's erste am meisten empfehlen dürfte, so sehe ich doch das Ziel, dem man zustreben sollte,



dartu, von der Naturforscherversammlung
unabhängig zu werden. Es könnte sogar
fraglich sein, ob man aus dem Rahmen der
jetzt fest organisirten Versammlung der
Naturforschern diejenige Beweglichkeit und
Freiheit der Bestimmung einräumen
wird, die in allen Fällen wünschenswerth ist.
Vgl. § 17 der neuen Statuten.

Ferner scheint es mir wünschenswerth,
und zweckmässig, wenn ausser den im Gesetz
genannten Aufgaben, mit denen sich die
Vereinigung eventuell zu befassen hätte, auch
die Möglichkeit bleibt, wie bisher, Referate
über eigene Forschungen zu geben.

Indem ich mich Ihnen bestens
empfehle, bin ich

mit vorzüglicher Hochachtung

Dr A. Schoenflies.

Richard von Mises

The *Gesellschaft für angewandte Mathematik und Mechanik* (GAMM) [Society for Applied Mathematics and Mechanics] was founded in 1922. In its early years, it owed much to its secretary Richard von Mises, who ran the Society alongside its president Ludwig Prandtl, who served until 1945. While Prandtl initially saw the GAMM more as a collection of mathematically-oriented engineers and engineering scientists, von Mises, from the very beginning, called for a society devoted to applied mathematics, a field which was becoming increasingly institutionalized and which he saw as an independent discipline.[5] His emphasis on the independence of applied mathematics, however, also to some extent put him in opposition with Richard Courant in Göttingen, who spoke out in the late 1920s against an institutional and intellectual separation of "pure" and "applied" mathematics. When von Mises stepped down as secretary of the GAMM in 1933 and emigrated to Turkey, there was a brief crisis in the society. Prandtl suggested that the entire board resign jointly. In the end, however, Prandtl and the GAMM decided against taking such drastic measures and accepted the loss.[6]

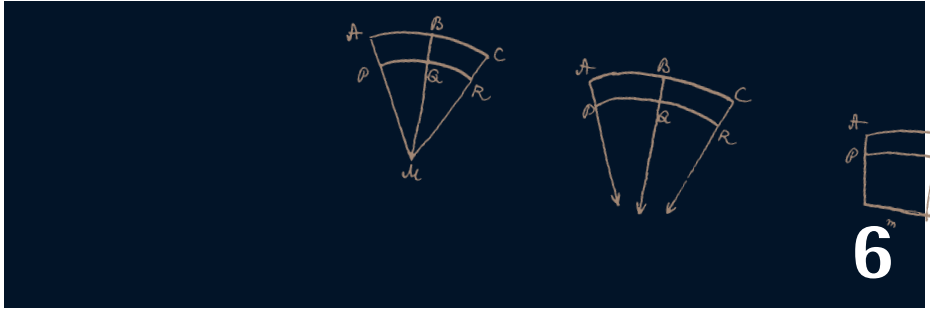
Moritz Epple and Volker R. Remmert

5 See (Mises 1921: 1-15).
6 See (Mehrtens 1985).

Г. РАДЕМАХЕР
и О. ТЕПЛИЦ

ЧИСЛА
и
ФИГУРЫ

ОНТИ 1938



6

Russian edition of *Von Zahlen und Figuren* [The Enjoyment of Mathematics] by Hans Rademacher and Otto Toeplitz

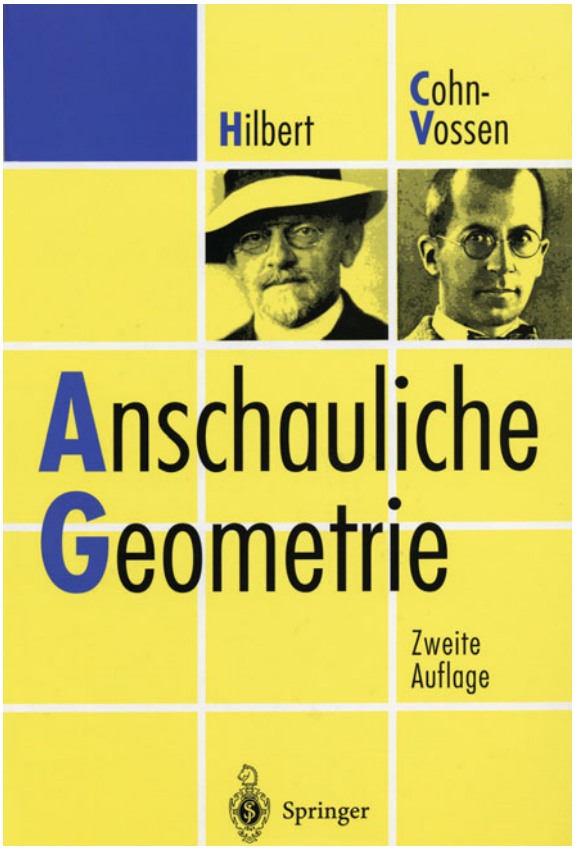
Mathematics in Culture

Jewish mathematicians were heavily involved in making the fascinating questions of their discipline accessible beyond the borders of their specialized community and in shedding light on the role mathematics played in culture at large.

B. Bergmann et al. (eds.), *Transcending Tradition*

Popularization

Many mathematicians attached great importance to introducing contemporary mathematics to an interested lay public. With this goal in mind, Otto Toeplitz, Stefan Cohn-Vossen, Edmund Landau and Hilda Geiringer, to name only a few, all wrote very successful works, some of which still enjoy great popularity today. These mathematicians were all convinced that it was possible to make every interested person, even those lacking advanced education in mathematics, appreciate contemporary mathematical questions.



In 1933, Otto Toeplitz and Hans Rademacher published *Von Zahlen und Figuren. Proben mathematischen Denkens für Liebhaber der Mathematik* [The Enjoyment of Mathematics: Selections from Mathematics for Amateurs].[1] In their foreword, Toeplitz and Rademacher write that it is possible to present mathematics to an uninitiated public and to do so in such a way "that they can enjoy it".[2] By means of carefully selected examples, the authors of this small book wanted to show that the aversion to mathematics felt by many would disappear if one attempted to present "real mathematics" undisguised.

Cohn-Vossen und Hilbert's *Anschauliche Geometrie* [Geometry and the imagination] was published in Springer Verlag's "Yellow Series" in 1932.[3] Like Toeplitz and Rademacher's book, this one too was translated into several languages, and it is still in print today. The title (the original means something like "vivid geometry") and intent of the book are remarkable: it constitutes an introduction to geometry that is expressly based on intuition. Not much later, intuition will be described as a special characteristic of "Aryan" mathematics not to be found anywhere in the work of Jewish mathematicians.[4]

In his book *Grundlagen der Analysis* [Foundations of Analysis], Edmund Landau attempted to address non-mathematicians and students of mathematics alike.[5] He wrote two forewords, one for specialists and one for learners. The latter begins with the words: "1. Please don't read the preface for the teacher. 2. I will ask of you only the ability to read English and to think logically – no high school mathematics, and certainly no higher mathematics." Landau dedicated the book to his daughters, who had difficulties in math class at school.

1 (Rademacher; Toeplitz 1930, 1957).
2 (Rademacher; Toeplitz 1930: III). Our translation.
3 (Cohn-Vossen; Hilbert 1932).
4 See essay "Academic Anti-Semitism" in this volume.
5 (Landau 1930, 1960).

The two prefaces for Edmund Landau's *Foundations of Analysis* (1960)

PREFACE FOR THE TEACHER

This little book is a concession to those of my colleagues (unfortunately in the majority) who do **not** share my point of view on the following question.

While a rigorous and complete exposition of elementary mathematics can not, of course, be expected in the high schools, the mathematical courses in colleges and universities should acquaint the student not only with the subject matter and results of mathematics, but also with its methods of proof. Even one who studies mathematics mainly for its applications to physics and to other sciences, and who must therefore often discover auxiliary mathematical theorems for himself, can not continue to take steps securely along the path he has chosen unless he has learned how to walk—that is, unless he is able to distinguish between true and false, between supposition and proof (or, as some say so nicely, between non-rigorous and rigorous proof).

I therefore think it right—as do some of my teachers and colleagues, some authors whose writings I have found of help, and most of my students—that even in his first semester the student should learn what the basic facts are, accepted as axioms, from which mathematical analysis is developed, and how one can proceed with this development. As is well known, these axioms can be selected in various ways; so that I do not declare it to be incorrect, but only to be almost diametrically opposite to my point of view, if one postulates as axioms for real numbers many of the usual rules of arithmetic and the main theorem of this book (Theorem 205, Dedekind's Theorem). I do not, to be sure, prove the consistency of the five Peano axioms (because that can not be done), but each of them is obviously independent of the preceding ones. On the other hand, were we to adopt a large number of axioms, as mentioned above, the question would immediately occur to the student whether some of them could not be proved (a shrewd one would add: or disproved) by means of the rest of them. Since it has been known for many decades that all these additional axioms can

Edmund Landau and his daughter

PREFACE FOR THE STUDENT

1. Please don't read the preface for the teacher.

2. I will ask of you only the ability to read English and to think logically—no high school mathematics, and certainly no higher mathematics.

To prevent arguments: **a** number, **no** number, **two** cases, **all** objects of a given totality, and so on, are completely unambiguous phrases. Theorem 1, Theorem 2, . . . , Theorem 301, or 1), 2), etc. for distinguishing the various cases, are labels which distinguish the theorems and the cases; similarly for axioms, definitions, chapters and sections. These are more convenient to refer to than if we were to speak, say, of Theorem Light-blue, Theorem Dark-blue, and so on. As a matter of fact, the introduction of the so-called positive integers up to "301" would not offer any difficulty whatsoever. The first difficulty—overcome in Chapter I—lies in the *totality* of the positive integers

$$1, \ldots$$

with the mysterious series of dots after the comma (called natural numbers in Chapter I), in the definition of the arithmetical operations with these numbers, and in the proofs of the associated theorems.

I develop analogous material, first for the natural numbers in Chap. I; then for the positive fractions and positive rational numbers, in Chap. II; next for the positive (rational and irrational) numbers, in Chap. III; next for the real numbers (positive, negative, and zero), in Chap. IV; and finally for the complex numbers, in Chap. V. Thus I speak only of such numbers as you have already met with in high school.

Apropos:

3. Please forget everything you have learned in school; for you haven't learned it.

Please keep in mind at all times the corresponding portions of your school curriculum; for you haven't actually forgotten them.

4. The multiplication table will not occur in this book, not even the theorem

$$2 \cdot 2 = 4,$$

but I would recommend, as an exercise for Chap. I, § 4, that you define

$$2 = 1 + 1,$$
$$4 = (((1 + 1) + 1) + 1),$$

and then prove the theorem.

5. Forgive me for "theeing" and "thouing" you.* One reason for my doing so is that this book is written partly *in usum delphinarum*,† since, as is well known (cf. E. Landau, *Vorlesungen über Zahlentheorie*, Vol. 1, p. V), my daughters have been studying (chemistry) for several semesters, think they have learned differential and integral calculus in school, and yet even today don't know why

$$x \cdot y = y \cdot x$$

is true.

Berlin, December 28, 1929

EDMUND LANDAU

* In the German edition Professor Landau uses the familiar "du" (thou) throughout this preface. [*Trans.*]

† For Delphine use. The Delphin Classics were prepared by French scholars for the use of the Dauphin of France, son of King Louis XIV. [*Trans.*]

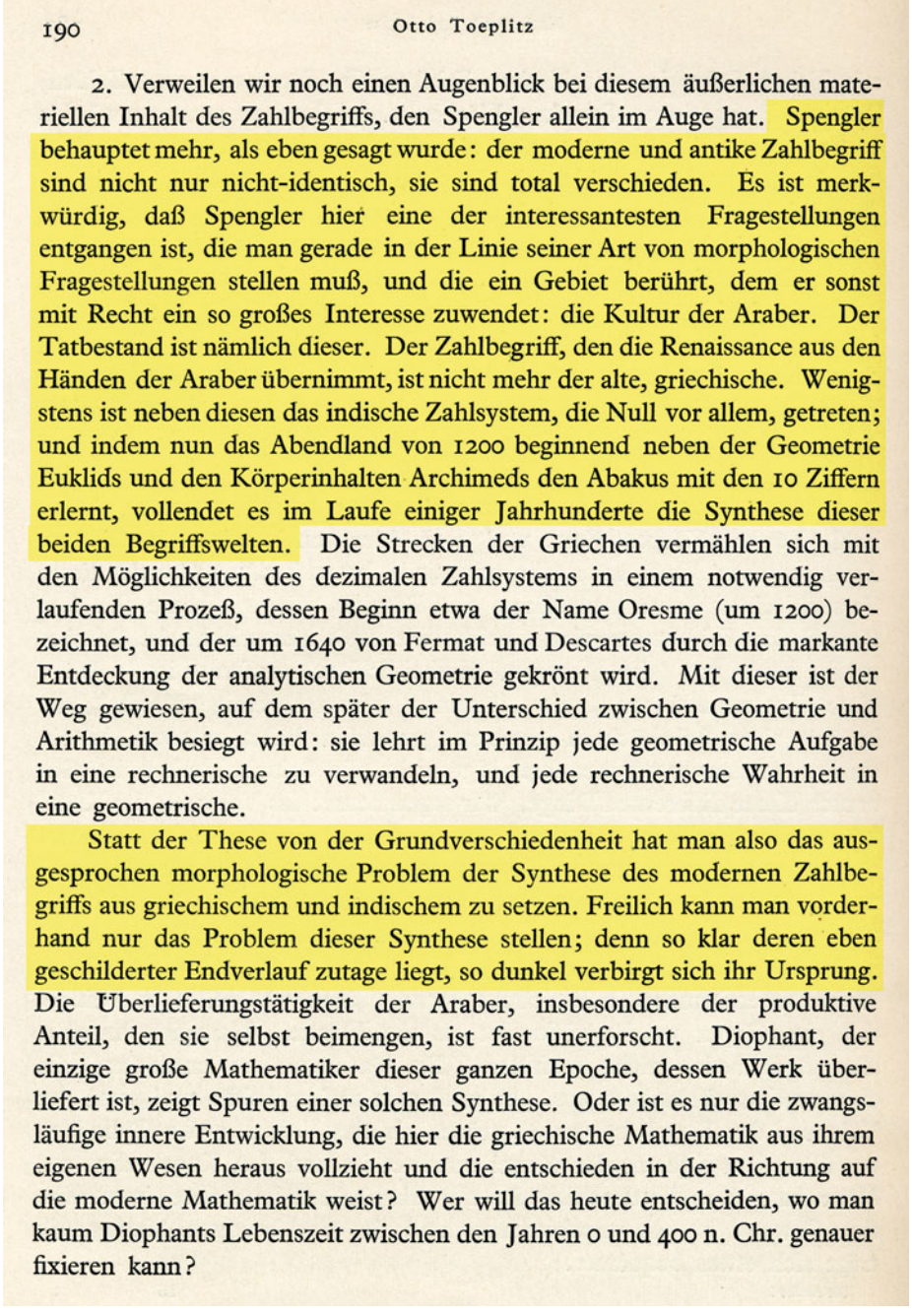
Hilda Geiringer

In 1922, Hilda Geiringer published a small book entitled *Die Gedankenwelt der Mathematik* [The conceptual world of mathematics].[6] It was conceived as the basis for a mathematics course to be taught from a scientific and philosophical perspective in an adult education program and included a comprehensive appendix for teachers. Geiringer's book was an attempt to interpret the latest findings in mathematics from a positivist point of view, closely following the hypotheses advanced by Ernst Mach with the intention of presenting these to an interested public.

6 (Geiringer 1922).

The cultural role of mathematics

Recognizing the genesis of mathematical knowledge as a cultural process and the science of mathematics as an element of human culture represented an important concern for many of the mathematicians discussed here. In their contributions on this subject, Jewish mathematicians therefore became involved in many debates about modern science and contemporary culture that took place throughout the Weimar era. For many of these mathematicians it was not merely a question of ascribing to mathematics – in contrast to technological "civilization" – a higher status as a "cultural asset", a common enough motive at the time: the point was indeed also to demonstrate that mathematics was cross-culturally universal in the very nature of human beings.



190 Otto Toeplitz

2. Verweilen wir noch einen Augenblick bei diesem äußerlichen materiellen Inhalt des Zahlbegriffs, den Spengler allein im Auge hat. Spengler behauptet mehr, als eben gesagt wurde: der moderne und antike Zahlbegriff sind nicht nur nicht-identisch, sie sind total verschieden. Es ist merkwürdig, daß Spengler hier eine der interessantesten Fragestellungen entgangen ist, die man gerade in der Linie seiner Art von morphologischen Fragestellungen stellen muß, und die ein Gebiet berührt, dem er sonst mit Recht ein so großes Interesse zuwendet: die Kultur der Araber. Der Tatbestand ist nämlich dieser. Der Zahlbegriff, den die Renaissance aus den Händen der Araber übernimmt, ist nicht mehr der alte, griechische. Wenigstens ist neben diesen das indische Zahlsystem, die Null vor allem, getreten; und indem nun das Abendland von 1200 beginnend neben der Geometrie Euklids und den Körperinhalten Archimeds den Abakus mit den 10 Ziffern erlernt, vollendet es im Laufe einiger Jahrhunderte die Synthese dieser beiden Begriffswelten. Die Strecken der Griechen vermählen sich mit den Möglichkeiten des dezimalen Zahlsystems in einem notwendig verlaufenden Prozeß, dessen Beginn etwa der Name Oresme (um 1200) bezeichnet, und der um 1640 von Fermat und Descartes durch die markante Entdeckung der analytischen Geometrie gekrönt wird. Mit dieser ist der Weg gewiesen, auf dem später der Unterschied zwischen Geometrie und Arithmetik besiegt wird: sie lehrt im Prinzip jede geometrische Aufgabe in eine rechnerische zu verwandeln, und jede rechnerische Wahrheit in eine geometrische.

Statt der These von der Grundverschiedenheit hat man also das ausgesprochen morphologische Problem der Synthese des modernen Zahlbegriffs aus griechischem und indischem zu setzen. Freilich kann man vorderhand nur das Problem dieser Synthese stellen; denn so klar deren eben geschilderter Endverlauf zutage liegt, so dunkel verbirgt sich ihr Ursprung. Die Überlieferungstätigkeit der Araber, insbesondere der produktive Anteil, den sie selbst beimengen, ist fast unerforscht. Diophant, der einzige große Mathematiker dieser ganzen Epoche, dessen Werk überliefert ist, zeigt Spuren einer solchen Synthese. Oder ist es nur die zwangsläufige innere Entwicklung, die hier die griechische Mathematik aus ihrem eigenen Wesen heraus vollzieht und die entschieden in der Richtung auf die moderne Mathematik weist? Wer will das heute entscheiden, wo man kaum Diophants Lebenszeit zwischen den Jahren 0 und 400 n. Chr. genauer fixieren kann?

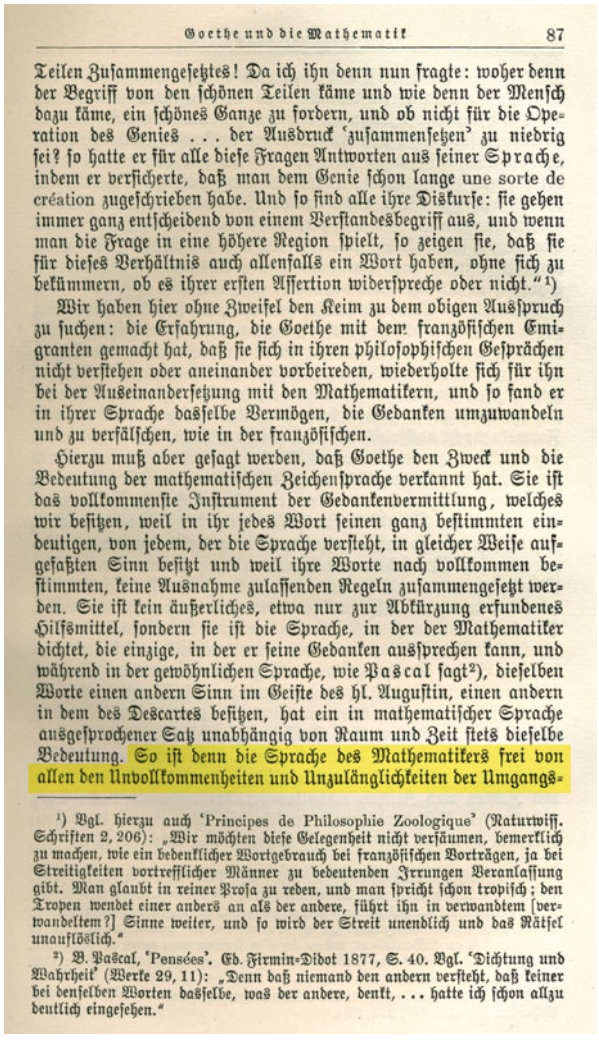
Otto Toeplitz, "Mathematik und Antike" [Mathematics and antiquity], in: *Die Antike* (1925), pp. 175–203

> [...] Spengler claims more than what has just been said: Not only are the modern and ancient concepts of numbers not identical, they are indeed diametrically different. It is strange that in this one point Spengler has failed to see one of the most interesting questions which, particularly along the lines of his kind of morphological considerations, begs an answer, and which touches on an area that he otherwise treats with great interest: the culture of the Arab world. The fact is this. The concept of numbers that was adopted from the Arabs at the time of the Renaissance is no longer the ancient Greek concept. At the very least, it has incorporated the Indian number system, above all the zero; and as the West, starting around 1200, added the ten-digit abacus to Euclid's geometry and Archimedes's [determination of] volumes, it has completed in the course of a few centuries the synthesis of the concept of these two conceptual worlds.
> [...]
> Rather than assuming a diametrical difference, what we are looking at, is the clearly morphological problem of forming, then, the modern concept of numbers by means of a synthesis of the Greek and Indian systems. Of course for the time being we can do no more than put forward the problem of this synthesis; while its outcome is clear, as we have just seen, its origin remains in the dark. [...]

Otto Toeplitz, for instance, felt the need to contribute to the debate surrounding Oswald Spengler's hypothesis of the "decline of the West". Spengler's assertion that every culture has its own mathematics and that in each case these various mathematics are incomprehensible for people of other cultures and eras provoked vehement criticism from Toeplitz.[7]

Paul Epstein, Extraordinarius at the University of Frankfurt, published several essays in which he attempted to equate Goethe's classical poetry with the clarity and precision of mathematical language.[8] He was convinced that Goethe's rejection of mathematics was due to his failure to recognize its true beauty. Epstein sought to eliminate the most obvious and best known contradiction between Goethe and mathematics by showing that ultimately both approaches to understanding the world had their source in the same motivation and led to the same goal. With these texts, Epstein joined the ranks of German-Jewish intellectuals who attached great importance to the classical German educational ideal known as "Bildung".

7 (Toeplitz 1925: 190).
8 (Epstein 1924a) and (Epstein 1924b).



Goethe und die Mathematik 87

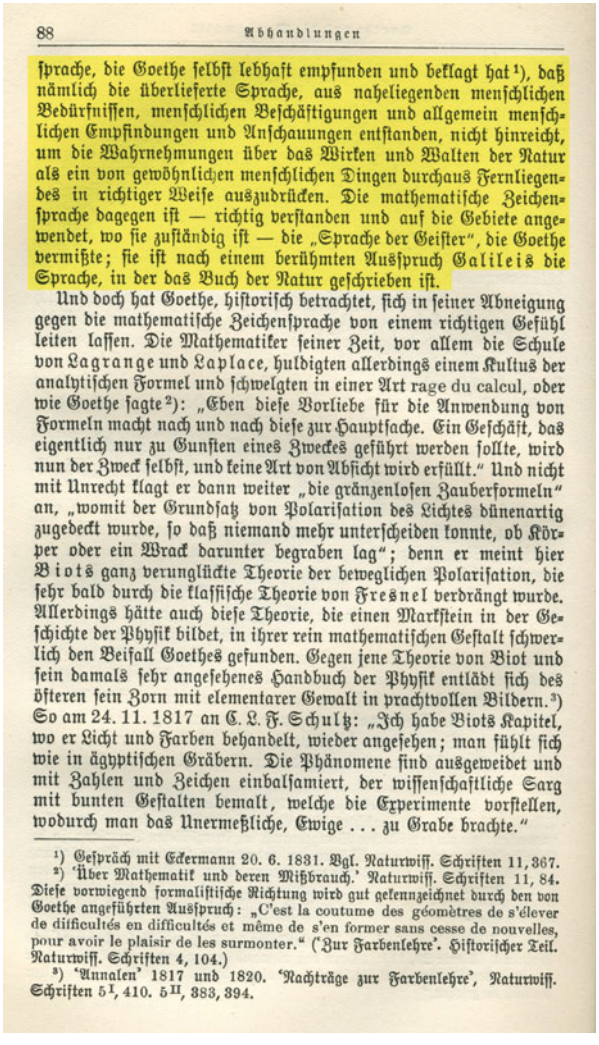
Teilen Zusammengesetztes! Da ich ihn denn nun fragte: woher denn der Begriff von den schönen Teilen käme und wie denn der Mensch dazu käme, ein schönes Ganze zu fordern, und ob nicht für die Operation des Genies ... der Ausdruck 'zusammensetzen' zu niedrig sei? so hatte er für alle diese Fragen Antworten aus seiner Sprache, indem er versicherte, daß man dem Genie schon lange une sorte de création zugeschrieben habe. Und so sind alle ihre Diskurse: sie gehen immer ganz entscheidend von einem Verstandesbegriff aus, und wenn man die Frage in eine höhere Region spielt, so zeigen sie, daß sie für dieses Verhältnis auch allenfalls ein Wort haben, ohne sich zu bekümmern, ob es ihrer ersten Assertion widerspreche oder nicht." [1])

Wir haben hier ohne Zweifel den Keim zu dem obigen Ausspruch zu suchen: die Erfahrung, die Goethe mit dem französischen Emigranten gemacht hat, daß sie sich in ihren philosophischen Gesprächen nicht verstehen oder aneinander vorbeireden, wiederholte sich für ihn bei der Auseinandersetzung mit den Mathematikern, und so fand er in ihrer Sprache dasselbe Vermögen, die Gedanken umzuwandeln und zu verfälschen, wie in der französischen.

Hierzu muß aber gesagt werden, daß Goethe den Zweck und die Bedeutung der mathematischen Zeichensprache verkannt hat. Sie ist das vollkommenste Instrument der Gedankenvermittlung, welches wir besitzen, weil in ihr jedes Wort seinen ganz bestimmten eindeutigen, von jedem, der die Sprache versteht, in gleicher Weise aufgefaßten Sinn besitzt und weil ihre Worte nach vollkommen bestimmten, keine Ausnahme zulassenden Regeln zusammengesetzt werden. Sie ist kein äußerliches, etwa nur zur Abkürzung erfundenes Hilfsmittel, sondern sie ist die Sprache, in der der Mathematiker dichtet, die einzige, in der er seine Gedanken aussprechen kann, und während in der gewöhnlichen Sprache, wie Pascal sagt [2]), dieselben Worte einen andern Sinn im Geiste des hl. Augustin, einen andern in dem des Descartes besitzen, hat ein in mathematischer Sprache ausgesprochener Satz unabhängig von Raum und Zeit stets dieselbe Bedeutung. So ist denn die Sprache des Mathematikers frei von allen den Unvollkommenheiten und Unzulänglichkeiten der Umgangs-

[1]) Vgl. hierzu auch 'Principes de Philosophie Zoologique' (Naturwiss. Schriften 2, 206): „Wir möchten diese Gelegenheit nicht versäumen, bemerklich zu machen, wie ein bedenklicher Wortgebrauch bei französischen Vorträgen, ja bei Streitigkeiten vortrefflicher Männer zu bedeutenden Irrungen Veranlassung gibt. Man glaubt in reiner Prosa zu reden, und man spricht schon tropisch; den Tropen wendet einer anders an als der andere, führt ihn in verwandtem [verwandeltem?] Sinne weiter, und so wird der Streit unendlich und das Rätsel unauflöslich."

[2]) B. Pascal, 'Pensées'. Éd. Firmin-Didot 1877, S. 40. Vgl. 'Dichtung und Wahrheit' (Werke 29, 11): „Denn daß niemand den andern versteht, daß keiner bei denselben Worten dasselbe, was der andere, denkt, ... hatte ich schon allzu deutlich eingesehen."



88 Abhandlungen

sprache, die Goethe selbst lebhaft empfunden und beklagt hat [1]), daß nämlich die überlieferte Sprache, aus naheliegenden menschlichen Bedürfnissen, menschlichen Beschäftigungen und allgemein menschlichen Empfindungen und Anschauungen entstanden, nicht hinreicht, um die Wahrnehmungen über das Wirken und Walten der Natur als ein von gewöhnlichen menschlichen Dingen durchaus Fernliegendes in richtiger Weise auszudrücken. Die mathematische Zeichensprache dagegen ist — richtig verstanden und auf die Gebiete angewendet, wo sie zuständig ist — die „Sprache der Geister", die Goethe vermißte; sie ist nach einem berühmten Ausspruch Galileis die Sprache, in der das Buch der Natur geschrieben ist.

Und doch hat Goethe, historisch betrachtet, sich in seiner Abneigung gegen die mathematische Zeichensprache von einem richtigen Gefühl leiten lassen. Die Mathematiker seiner Zeit, vor allem die Schule von Lagrange und Laplace, huldigten allerdings einem Kultus der analytischen Formel und schwelgten in einer Art rage du calcul, oder wie Goethe sagte [2]): „Eben diese Vorliebe für die Anwendung von Formeln macht nach und nach diese zur Hauptsache. Ein Geschäft, das eigentlich nur zu Gunsten eines Zweckes geführt werden sollte, wird nun der Zweck selbst, und keine Art von Absicht wird erfüllt." Und nicht mit Unrecht klagt er dann weiter „die gränzenlosen Zauberformeln" an, „womit der Grundsatz von Polarisation des Lichtes dünenartig zugedeckt wurde, so daß niemand mehr unterscheiden konnte, ob Körper oder ein Wrack darunter begraben lag"; denn er meint hier Biots ganz verunglückte Theorie der beweglichen Polarisation, die sehr bald durch die klassische Theorie von Fresnel verdrängt wurde. Allerdings hätte auch diese Theorie, die einen Markstein in der Geschichte der Physik bildet, in ihrer rein mathematischen Gestalt schwerlich den Beifall Goethes gefunden. Gegen jene Theorie von Biot und sein damals sehr angesehenes Handbuch der Physik entlädt sich des öfteren sein Zorn mit elementarer Gewalt in prachtvollen Bildern. [3]) So am 24. 11. 1817 an C. L. F. Schultz: „Ich habe Biots Kapitel, wo er Licht und Farben behandelt, wieder angesehen; man fühlt sich wie in ägyptischen Gräbern. Die Phänomene sind ausgeweidet und mit Zahlen und Zeichen einbalsamiert, der wissenschaftliche Sarg mit bunten Gestalten bemalt, welche die Experimente vorstellen, wodurch man das Unermeßliche, Ewige ... zu Grabe brachte."

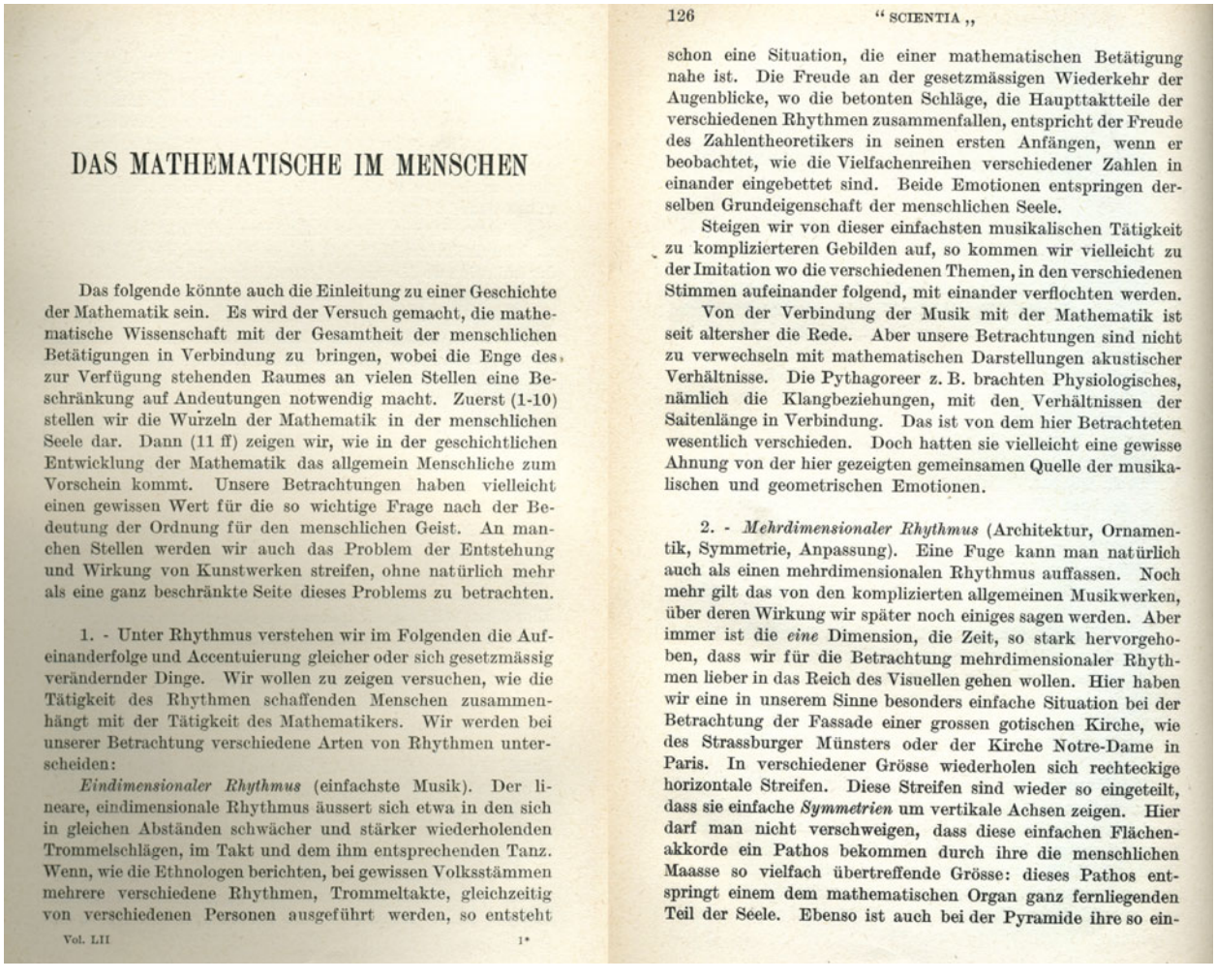
[1]) Gespräch mit Eckermann 20. 6. 1831. Vgl. Naturwiss. Schriften 11, 367.
[2]) 'Über Mathematik und deren Mißbrauch.' Naturwiss. Schriften 11, 84. Diese vorwiegend formalistische Richtung wird gut gekennzeichnet durch den von Goethe angeführten Ausspruch: „C'est la coutume des géomètres de s'élever de difficultés en difficultés et même de s'en former sans cesse de nouvelles, pour avoir le plaisir de les surmonter." ('Zur Farbenlehre'. Historischer Teil. Naturwiss. Schriften 4, 104.)
[3]) 'Annalen' 1817 und 1820. 'Nachträge zur Farbenlehre', Naturwiss. Schriften 5^{I}, 410. 5^{II}, 383, 394.

Paul Epstein, "Goethe und die Mathematik" [Goethe and mathematics] in: *Jahrbuch der Goethegesellschaft* 10 (1924), pp. 76–100

[...] Thus, the language of the mathematician is free of all the imperfections and shortcomings of colloquial language, which Goethe himself vividly felt, deploring that language as we know it, which has developed from obvious human needs, human activities and general human sentiments and views, is not adequate to correctly express perceptions of the functioning and workings of nature as something which is indeed far removed from common human affairs. The mathematical sign language, however, – correctly understood and used in the fields to which it is suited – is the "Language of the Spirits" which Goethe sought; according to a famous dictum of Galileo, it is the language in which the Book of Nature is written. [...]

Whenever mathematicians attempted to make their science accessible to audiences of non-mathematicians, or to convince the general public that mathematics was and should be an integral component of education, this effort also reflected the conviction that every person had the capacity to understand mathematics.

In 1932, Frankfurt mathematician Max Dehn wrote an essay entitled "Das Mathematische im Menschen" [The mathematical ability in humans] for *Scientia*, an Italian scientific journal edited at the time by Federigo Enriques in Bologna.[9] In this essay, Dehn attempted, as he wrote, "to link the science of mathematics with the whole of human activity".[10] According to Dehn, only a few preconditions are necessary to bring about mathematics. Mathematics, he claimed, arises of its own accord whenever mathematical emotion and logical conclusions come together – and all human beings have both capacities. Dehn thus positioned "the mathematical ability" at a basic anthropological level. The belief that mathematics is deeply rooted in human nature, in much the same way that music is based on innate musical abilities, gave him the confidence that non-professional mathematicians could also be made to appreciate this science.



DAS MATHEMATISCHE IM MENSCHEN

Das folgende könnte auch die Einleitung zu einer Geschichte der Mathematik sein. Es wird der Versuch gemacht, die mathematische Wissenschaft mit der Gesamtheit der menschlichen Betätigungen in Verbindung zu bringen, wobei die Enge des zur Verfügung stehenden Raumes an vielen Stellen eine Beschränkung auf Andeutungen notwendig macht. Zuerst (1-10) stellen wir die Wurzeln der Mathematik in der menschlichen Seele dar. Dann (11 ff) zeigen wir, wie in der geschichtlichen Entwicklung der Mathematik das allgemein Menschliche zum Vorschein kommt. Unsere Betrachtungen haben vielleicht einen gewissen Wert für die so wichtige Frage nach der Bedeutung der Ordnung für den menschlichen Geist. An manchen Stellen werden wir auch das Problem der Entstehung und Wirkung von Kunstwerken streifen, ohne natürlich mehr als eine ganz beschränkte Seite dieses Problems zu betrachten.

1. - Unter Rhythmus verstehen wir im Folgenden die Aufeinanderfolge und Accentuierung gleicher oder sich gesetzmässig verändernder Dinge. Wir wollen zu zeigen versuchen, wie die Tätigkeit des Rhythmen schaffenden Menschen zusammenhängt mit der Tätigkeit des Mathematikers. Wir werden bei unserer Betrachtung verschiedene Arten von Rhythmen unterscheiden:

Eindimensionaler Rhythmus (einfachste Musik). Der lineare, eindimensionale Rhythmus äussert sich etwa in den sich in gleichen Abständen schwächer und stärker wiederholenden Trommelschlägen, im Takt und dem ihm entsprechenden Tanz. Wenn, wie die Ethnologen berichten, bei gewissen Volksstämmen mehrere verschiedene Rhythmen, Trommeltakte, gleichzeitig von verschiedenen Personen ausgeführt werden, so entsteht

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schon eine Situation, die einer mathematischen Betätigung nahe ist. Die Freude an der gesetzmässigen Wiederkehr der Augenblicke, wo die betonten Schläge, die Haupttaktteile der verschiedenen Rhythmen zusammenfallen, entspricht der Freude des Zahlentheoretikers in seinen ersten Anfängen, wenn er beobachtet, wie die Vielfachenreihen verschiedener Zahlen in einander eingebettet sind. Beide Emotionen entspringen derselben Grundeigenschaft der menschlichen Seele.

Steigen wir von dieser einfachsten musikalischen Tätigkeit zu komplizierteren Gebilden auf, so kommen wir vielleicht zu der Imitation wo die verschiedenen Themen, in den verschiedenen Stimmen aufeinander folgend, mit einander verflochten werden.

Von der Verbindung der Musik mit der Mathematik ist seit altersher die Rede. Aber unsere Betrachtungen sind nicht zu verwechseln mit mathematischen Darstellungen akustischer Verhältnisse. Die Pythagoreer z. B. brachten Physiologisches, nämlich die Klangbeziehungen, mit den Verhältnissen der Saitenlänge in Verbindung. Das ist von dem hier Betrachteten wesentlich verschieden. Doch hatten sie vielleicht eine gewisse Ahnung von der hier gezeigten gemeinsamen Quelle der musikalischen und geometrischen Emotionen.

2. - *Mehrdimensionaler Rhythmus* (Architektur, Ornamentik, Symmetrie, Anpassung). Eine Fuge kann man natürlich auch als einen mehrdimensionalen Rhythmus auffassen. Noch mehr gilt das von den komplizierten allgemeinen Musikwerken, über deren Wirkung wir später noch einiges sagen werden. Aber immer ist die *eine* Dimension, die Zeit, so stark hervorgehoben, dass wir für die Betrachtung mehrdimensionaler Rhythmen lieber in das Reich des Visuellen gehen wollen. Hier haben wir eine in unserem Sinne besonders einfache Situation bei der Betrachtung der Fassade einer grossen gotischen Kirche, wie des Strassburger Münsters oder der Kirche Notre-Dame in Paris. In verschiedener Grösse wiederholen sich rechteckige horizontale Streifen. Diese Streifen sind wieder so eingeteilt, dass sie einfache *Symmetrien* um vertikale Achsen zeigen. Hier darf man nicht verschweigen, dass diese einfachen Flächenakkorde ein Pathos bekommen durch ihre die menschlichen Maasse so vielfach übertreffende Grösse: dieses Pathos entspringt einem dem mathematischen Organ ganz fernliegenden Teil der Seele. Ebenso ist auch bei der Pyramide ihre so ein-

First page of Max Dehn's "Das Mathematische im Menschen" [The mathematical ability in humans] in: *Scientia* (Bologna) 52 (1932), pp. 125–140

9 (Dehn 1932).
10 (Dehn 1932: 125).

The mathematical ability in humans

The following could also be the introduction to a history of mathematics. It is an attempt to link the science of mathematics with the whole of human activity, whereby in many cases the limited space available here will force us to restrict our comments to short allusions. At first, we will outline the roots of mathematics in the human soul. We will then show how the historical development of mathematics reflects the general human condition. Our considerations might have a certain value regarding the ever so important question of the meaning of order for the human mind. In some passages we will also touch upon the problem of the creation and the impact of works of art, although we will of course be considering only a very narrow aspect of this problem.

1. – In the coming pages, rhythm will be understood as being the succession and accentuation of identical or regularly changing things. We will attempt to demonstrate how the activity of a human being creating a rhythm is related to the work of a mathematician. In our considerations, we will distinguish different kinds of rhythm:

One-dimensional rhythm (simple music). Linear, one-dimensional rhythm manifests itself, for instance, in drumbeats that are strongly and less strongly repeated at equal intervals, in the beat and in the accompanying dance. When, as ethnologists tell us, groups of people in certain tribes perform several distinct rhythms or drumbeats at the same time, they create a situation that already comes close to mathematical activity. The delight in the regular recurrence of moments when the accentuated beats, the main strong beats of the various rhythms, coincide corresponds to the delight of the beginner number theorist when he realizes how the sequences of multiples of various numbers are embedded in each other. The two emotions arise from the same basic characteristic of the human soul.

Moving from this simplest of musical activities on to more complicated constructs, we might come to the imitation, where various themes following each other in several voices become intertwined.
Human beings have known for centuries that there is a link between music and mathematics. However, our considerations are not to be confused with mathematical descriptions of acoustic conditions. The Pythagoreans, for instance, made the connection between physiological phenomena such as tonal relationships and the length of strings. This is fundamentally different from what will be examined here. Nevertheless, they may indeed have had a certain idea of the common source of musical and geometric emotions that we have just described.

2. – *Higher dimensional rhythm* (architecture, ornamentics, symmetry, adaptation). [...]

The conviction that mathematics is one of the fundamental human faculties inspired many to join in discussions about mathematics education. Only one example will be given here: the controversy about university didactics involving Alfred Pringsheim, which garnered much attention. Pringsheim's involvement with this subject began in 1897 at the German Mathematical Society's annual meeting in Braunschweig and continued as an amiable debate with Felix Klein at the annual meeting in Düsseldorf the following year.[11] Klein and Pringsheim disagreed on which approach to differential calculus and integral calculus was most appropriate in introductory lectures. While Pringsheim favored a structured, modern introduction of basic concepts, Klein advocated clarity and practical orientation; alongside the "Präzisionsmathematik" [mathematics of precision] of pure mathematics, he proposed the concept of "Approximationsmathematik" [mathematics of

11 The lectures which Pringsheim and Klein held at these assemblies were published in German in the annual reports of the German Mathematical Society (DMV): (Pringsheim 1897), (Pringsheim 1898) and (Klein 1898).

approximation], which was sufficient for engineers. In staking out their positions, both were contributing to the modernization of the science of mathematics which was then already underway.

At the annual meeting in Braunschweig, Pringsheim explained:
"First of all I would like to state explicitly that it is in no way a question of burdening the student's brain from the very beginning with particular subtleties of the theory of functions. All we want to do is to create a sound logical foundation by equipping him with an adequate concept of the nature of numbers, to a certain extent setting up before his eyes clearly and in its full breadth the instrument with which he will continuously have to operate. [....] If proper arithmetical foundations have been laid to the extent which we have discussed, geometrical intuition may fall into place."[12]

A year later in Düsseldorf, Klein countered:
"Then I nevertheless say, as I often have, that it is not enough to teach abstract mathematics at university, that we must also give our students the opportunity to learn much more about the applications of mathematics than what is being done on average at present. [....] This means that everywhere where we apply analysis to the conditions of reality it is not the strict concept of the number in its modern form that is most important but the abbreviated notion of quantity (if I may be allowed such an expression) that is expressed by a finite number of decimal places. We do not need modern precision mathematics to explain natural processes, rather a mathematics of those relationships that take place with limited precision."[13]

To which Pringsheim answered:
"[...] therefore I cannot really understand the extent to which a kind of mathematics of approximations might be able to replace infinitesimal calculus, the real power and practical usefulness of which appears to me to reside precisely in the wonderful precision of its algorithms. Nonetheless, I will gladly let someone set me straight as soon as this mathematics of approximations, which at the moment appears to exist only rather insubstantially, achieves concrete existence."[14]

The Pringsheims were wealthy and their large house, situated on Arcisstrasse in Munich, was a social meeting point. In 1904 their only daughter, named Katharina but called Katia, married the writer Thomas Mann.

Birgit Bergmann

12 (Pringsheim 1897: 77, 82).
13 (Klein 1898: 131, 137).
14 (Pringsheim 1899: 144f.).

Alfred Pringsheim

Alfred and Hedwig Pringsheim visiting Katia and Thomas Mann (behind Katia: Elisabeth and Golo Mann)

Children's carnival at the Pringsheims, oil painting, 1888. Katia is on the far left.

Verlag v. F. Adami, Emden.

Gruss aus BORKUM

Bedaure!

Doch wer dir naht mit platten Füßen,
– – – – – der muß hinaus! „Hinaus!"

Borkum-Lied.

Weise: „Hipp, hipp, hurrah!"

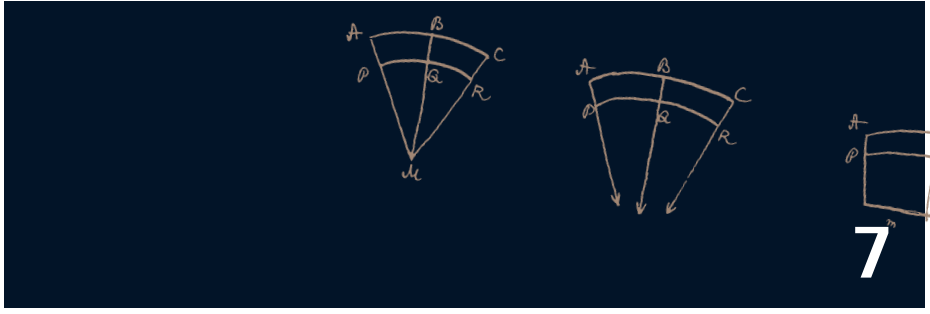
1. Wir grüßen heut' im frohen Lied
Dich, Borkums schönen Strand.
Wo durch die Luft die Möve zieht,
Und grün sich dehnt das Land!
Wo an die Dünen braust die See
Des Nordens wild heran.
[: Wo Leuchtturms Licht von stolzer Höh'
Dem Schiffer weist die Bahn. :]
Drum wollen laut dein Lob wir singen,
Wir Gäste all', von fern und nah,
Begeistert soll der Ruf erklingen:
Borkum hurrah! Borkum hurrah!

2. Wohl gibt es Bäder viel und reich
Im weiten Vaterland,
Doch kommt an Wert dir keines gleich,
Du prächt'ger Inselstrand, —
In deinem Zauberbann, wie weicht
Die Sorge scheu zurück!
[: Wie wird das Herz so frisch und leicht,
Wie hebt sich froh der Blick! :]
Drum wollen laut dein Lob wir singen,
Wir Gäste all', von fern und nah,
Begeistert soll der Ruf erklingen:
Borkum hurrah! Borkum hurrah!

3. Es herrscht im grünen Inselland
Ein echter deutscher Sinn.
Drum alle, die uns stammverwandt,
Ziehn freudig zu dir hin.
An Borkums Strand nur Deutschtum gilt,
Nur deutsch ist das Panier.
[: Wir halten rein den Ehrenschild
Germanias für und für! :]
Doch wer dir naht mit platten Füßen,
Mit Nasen krumm und Haaren kraus,
Der soll nicht deinen Strand genießen,
Der muß hinaus! der muß hinaus!

4. 'ne Lustfahrt, die von Norderney
Hier eines Tags traf ein,
Da war'n auch „unsre Leit'" dabei
Wie's anders nicht konnt' sein.
Doch als man die hier hat erblickt,
Rief alles im Verein:
[: „Borkum, bewahre deinen Strand,
Nichts Koschres laß herein!" :]
Rebeckchen Meier und Herr Lewi
Kehrt schnell nach Norderney nach Haus
Allhier auf Borkums grüner Insel
Blüht Euch kein Glück, Ihr müßt hinaus.

5. Doch naht die Zeit, da wir von hier
Scheiden mit frohem Sinn,
So nimm von uns als letzten Gruß
Noch diese Worte hin:
„Borkum, der Nordsee schönste Zier,
Bleib du von Juden rein,
[: Laß Rosenthal und Lewisohn
In Norderney allein!" :]
Doch wer dir naht mit platten Füßen,
Mit Nasen krumm und Haaren kraus,
Der soll nicht deinen Strand genießen,
Der muß hinaus! der muß hinaus!
„Hinaus!"

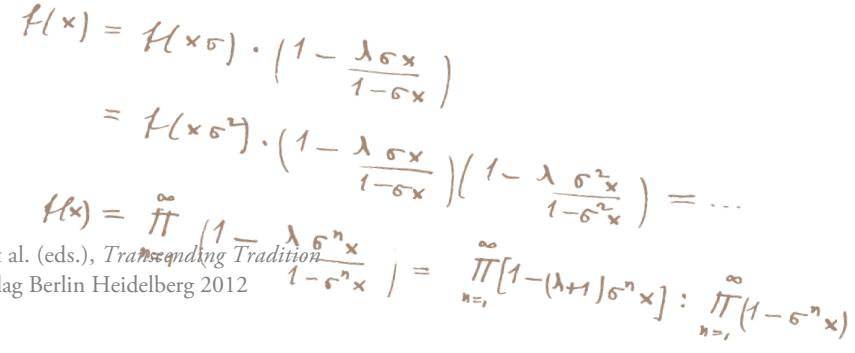


7

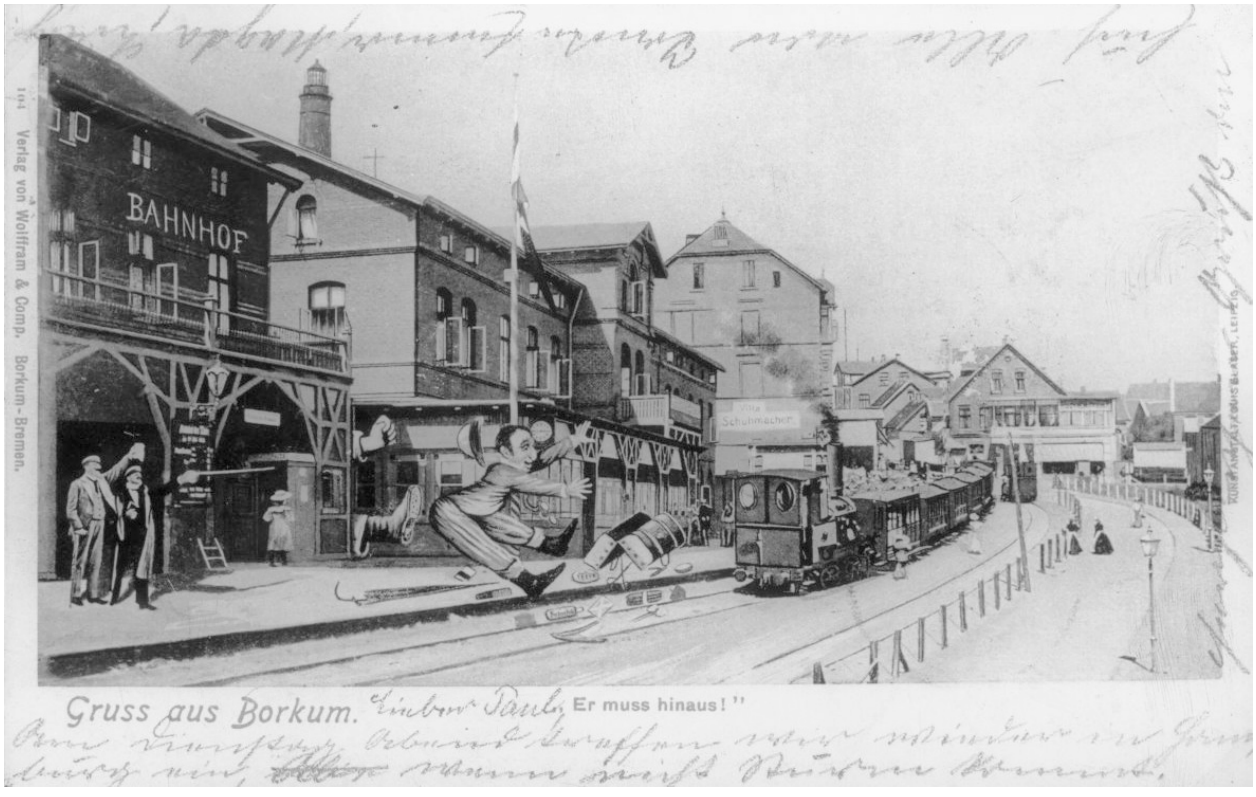
The virulently anti-Semitic "Borkum song": "But he who comes on flat foot waddling ... Out he goes! Go out!" The song, written in the 1890s, was sung by the spa ensemble in Borkum with the approval of the municipal council. The seaside resort openly made use of racial taunts in competing with the seaside resort of Norderney, and in so doing primarily attracted German nationalists as guests.

Academic Anti-Semitism

Anti-Semitism remained a stable element in the history of Christian Europe for centuries. This hardly changed when, starting in the mid-nineteenth century, Jews gradually gained acceptance to academic careers. A closer look at the academic life of German-Jewish mathematicians reveals the extent to which anti-Semitic prejudices were responsible for career obstacles and discrimination.



B. Bergmann et al. (eds.), *Transcending Tradition*



Postcards from Borkum (1905) and the Kölner Hof Hotel in Frankfurt am Main (ca. 1900) [The sign on the column reads: "Off limits for Jews"]

The civil rights granted to Jews in the aftermath of the French Revolution and gradually adopted in the German states in the period leading up to the March Revolution of 1848 were slow in coming and remained tenuous. In many professions, especially in the civil service, discrimination never stopped. By the end of the Wilhelmine Empire, German Jews had become equal *de jure*, but *de facto* they remained excluded from many aspects of German life. It was not until the Weimar Republic – in the years between 1919 and 1932 – that all legal restrictions against Jews were removed but at the same time these years were marked by increasingly brutal anti-Semitism. While medieval anti-Jewish sentiment had been mostly religious in origin, the 19th century saw the growth of a new kind of anti-Semitism that claimed scientific legitimation through the concept of "race".

Anti-Semitism was expressed openly and threateningly in the streets of Weimar Germany: there were marches by Nazi groups and brutal attacks by Nazi thugs, cemetery desecrations, anti-Semitic caricatures and signs banning Jews from public places. Jewish organizations found themselves compelled to publish warnings about certain seaside and health resorts.[1] During the Weimar Republic, Jews were often the target of political assassinations, the murder of Walther Rathenau (1867-1922) in June 1922 being the best-known example.[2]

As described earlier in this volume, advancement through education had to some extent been a successful way for German Jews to reach equality and recognition. The percentage of Jews pursuing careers in science, in the arts and in certain professions increased steadily. And yet, anti-Semitism remained constantly present, not least in academic milieus. Jews were still *de facto* excluded from high positions in the civil service or at colleges and universities. Even in the Weimar Republic, conversion sometimes still seemed the best option to circumvent these restrictions, for example in order to get a full professorship at a university.

Anti-Semitism was not restricted to uneducated people. On the contrary, it was defended, published and echoed in the mass media by German intellectuals. It was openly expressed at colleges and universities by both students and professors. The historian and professor Heinrich von Treitschke, who set off the so-called "Berlin anti-Semitism debate" in the 1880s, was not an isolated instance.[3] Referring to this period, the lawyer and émigré Adolph Asch (1881-1972) later wrote: "The period of 1878 to 1886 was one of the darkest times for Jewish students. Stoecker's inflammatory speeches and the anti-Jewish attitudes of a number of professors were echoed by a significant number of students, who at the same time formed a union at various universities with an anti-Semitic agenda. [...] the enrollment of Jewish students [became] an exception".[4]

There is still very little information about anti-Semitism among academic staff at universities and research institutes. The documentation published by Moritz Kalisch in 1860 reveals the extent of the mistrust felt vis-à-vis Jewish colleagues and the resistance that existed in the academic world about offering them equal chances in university faculties and in all scientific fields. Kalisch published the results of a poll of Prussian universities in summer 1847 regarding the question of whether they would allow Jews to teach medicine, mathematics and sciences.[5] The negative attitude of the university faculties was greater than that of the Prussian Ministry of Culture. Little would change in this regard until the Weimar Republic,[6] but there

1 See (Bajohr 2003).
2 On political murders in the early years of the Weimar Republic see (Gumbel 1920, 1968 [1922]).
3 See essay "From Exclusion to Acceptance, from Acceptance to Persecution" in this volume.
4 (Asch 1964: 9). As of 1874, Adolf Stoecker (1835-1909) was court chaplain in Berlin and one of the most notorious propagandists of anti-Semitism between 1878 and 1900. In 1878 he set up the Christian Social Worker's Party (as of 1881 Christian Social Party), which openly fought against the SPD and "the Jews". In addition, the League of Anti-Semites was founded in Berlin in 1879 by the racist journalist Wilhelm Marr (1819-1904). See (Scheil 1999).
5 See (Kalisch 1860: 81-232), *Vota der preussischen Universitäten über die Zulassung jüdischer Lehrer nach dem Gesetz vom 23. Juli 1847* [Statements of the Prussian universities on the admission of Jewish teachers pursuant to the law of 23 July 1847].
6 On anti-Semitism in the Weimar Republic, see (Benz 1998) and (Walter 1999).

is no documentation for this later period that might allow a comparison to the results published by Kalisch.

Anti-Semitism in mathematics

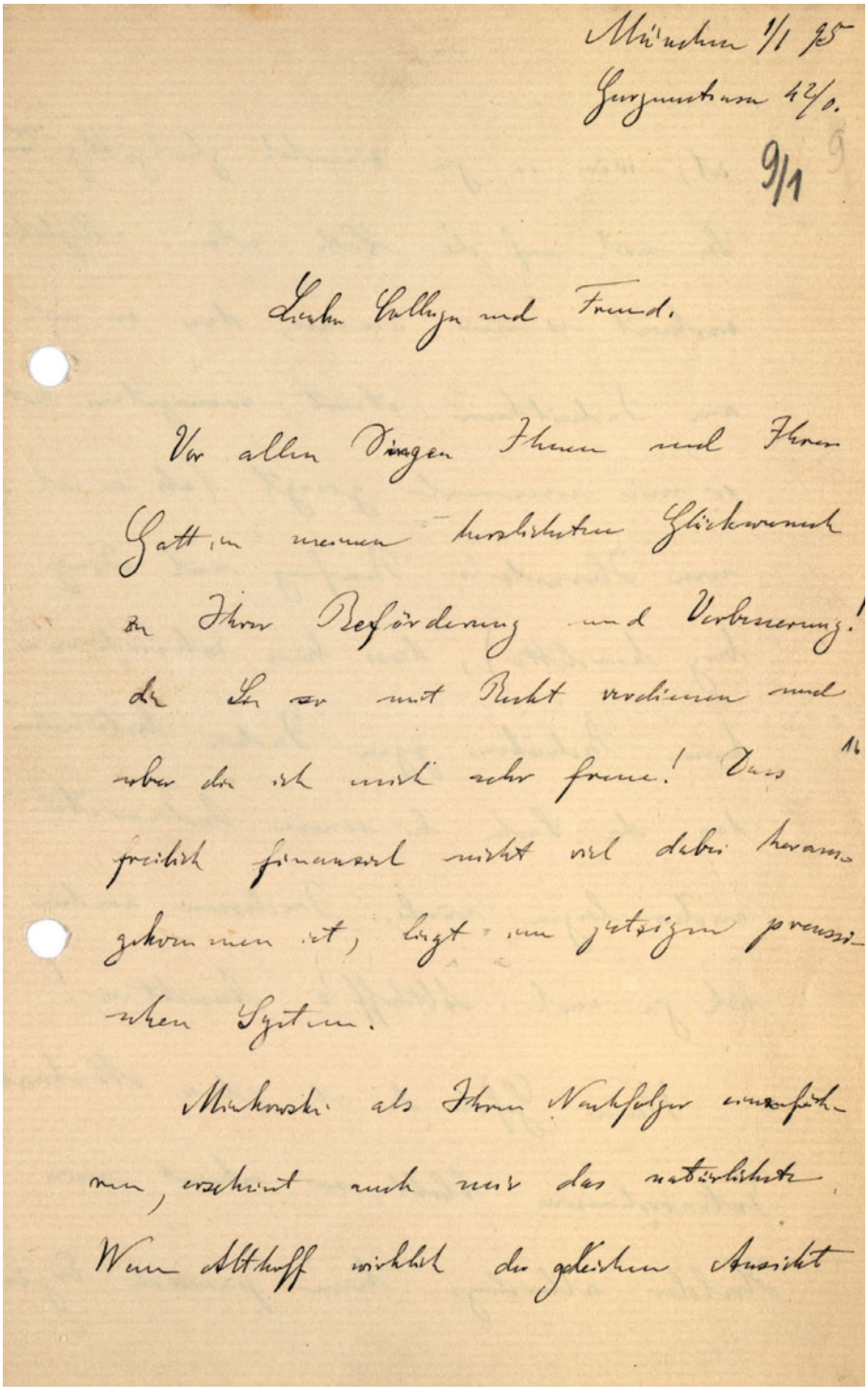
Jewish mathematicians felt the brunt of anti-Semitism most bitterly whenever they applied for higher appointments and positions. For Jewish scholars, the habilitation procedure could become an insurmountable hurdle. Even if they managed to surmount it, appointments as Extraordinarius came later than for Christian colleagues, and appointments as full professors often fell through even when the mathematician in question was the faculty's first candidate. In official documents, however, there are no clear and openly formulated rejections of these scholars because of their being Jewish, and no openly anti-Semitic reasons for the decisions not to appoint them. The Prussian Ministry of Culture, which appointed all professors at Prussian universities, either did not react when a faculty recommended a Jewish mathematician, or the recommendation was rejected without explanation or with the always valid argument of lack of funds. At Berlin University this happened to Gotthold Eisenstein (1847), Kurt Hensel (the faculty request that he should be appointed Extraordinarius (in 1890), Ludwig Schlesinger (who was not made Extraordinarius in 1893), Edmund Landau (who was denied the post of Extraordinarius in 1904 and again in 1908) and Issai Schur (who was often recommended as Extraordinarius by Georg Frobenius between 1902 and 1913 and always turned down). The fact that in the 57 years between 1845 and 1902 only eight Jewish mathematicians were allowed to become Privatdozent in Berlin is a clear indication of latent anti-Semitism. In contrast, during the more liberal years of the Weimar Republic – a period spanning only fourteen years – a total of nine Jewish mathematicians became Privatdozent.[7] Similar examples can be given for other universities.

The anti-Semitic attitudes and prejudices to which Jewish mathematicians were subjected at universities and which left their mark on their daily professional lives remain difficult to trace. After noticing the discrepancy in the appointments of Christian and Jewish mathematicians, Kurt-R. Biermann searched for such traces in official documents related to Berlin University, but with no more than limited results.[8] Even in mathematicians' correspondence and private papers, there are only few direct and open references to a person's Jewish origins or religion having played or being likely to play a role in his or her professional advancement.

After Heinrich Weber was offered an appointment at the University of Strasbourg (which was part of Germany at the time), Felix Klein suggested to Friedrich Althoff, the undersecretary at the Prussian Ministry of Culture who was responsible for appointments, the nomination of David Hilbert as professor at Göttingen, and Hilbert got the position in December 1894. At the same time, Hilbert suggested to Althoff that Hermann Minkowski should be appointed his successor at Königsberg. Minkowski did indeed get his appointment to Königsberg in 1895, but before the decision was taken Ferdinand Lindemann in Königsberg thought it necessary to warn Hilbert in advance of Althoff's potential reservations related to "Jewishness".

7 On Berlin mathematics, see (Biermann 1988) and (Begehr 1998).

8 (Biermann 1988), especially on Kurt Hensel, Ludwig Schlesinger, Edmund Landau and Issai Schur; see also essay "From Exclusion to Acceptance, from Acceptance to Persecution" in this volume.



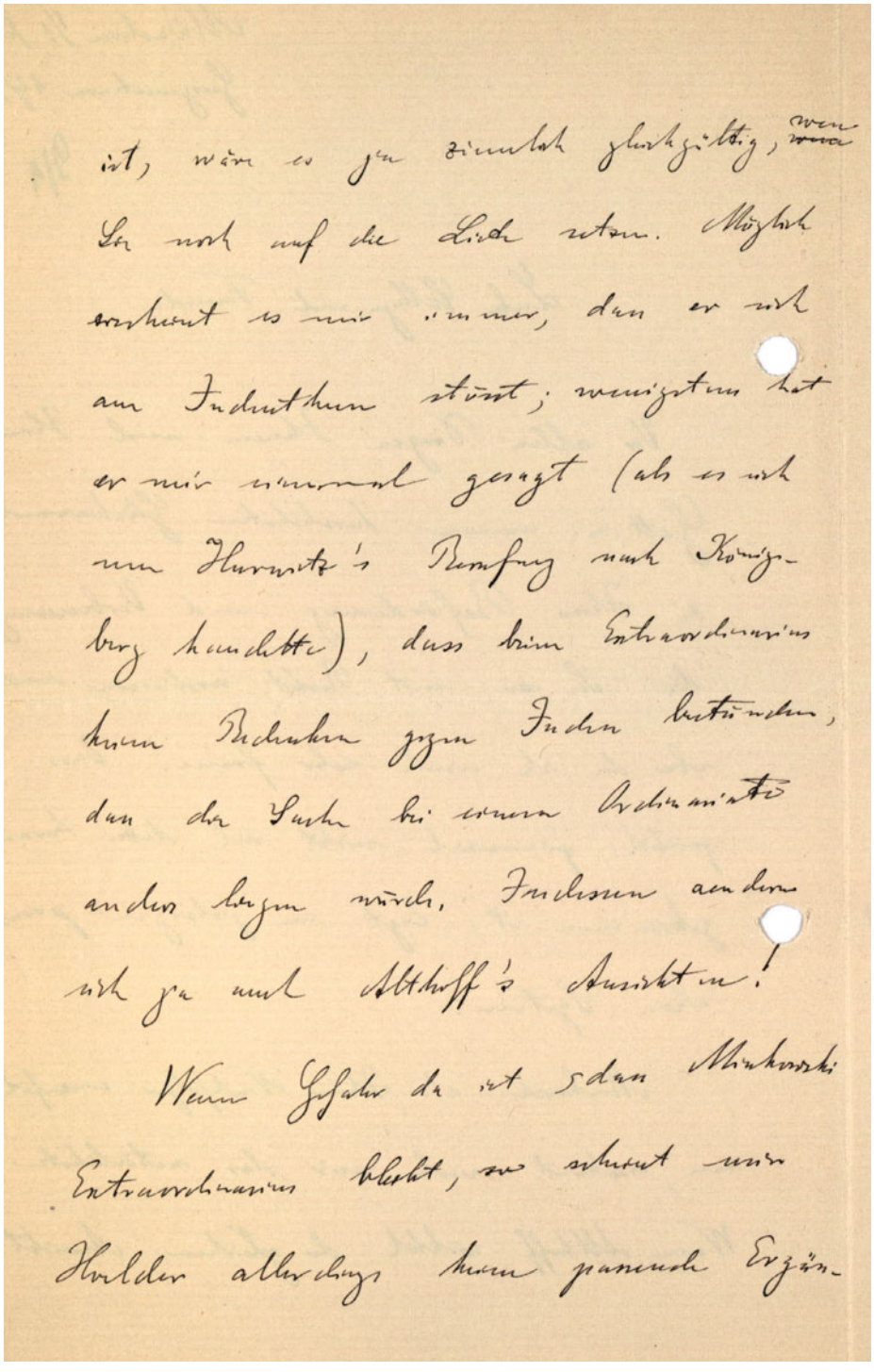
München 1/1 95
Georgenstrasse 42/0.
9/1

Lieber Collega und Freund.

Vor allen Dingen Ihnen und Ihrer Gattin meinen herzlichsten Glückwunsch zu Ihrer Beförderung und Verbeserung! die Sie so mit Recht verdienen und über die ich mich sehr freue! Dass freilich Finanzrath nicht viel dabei herausgekommen ist, liegt am jetzigen preussischen System.

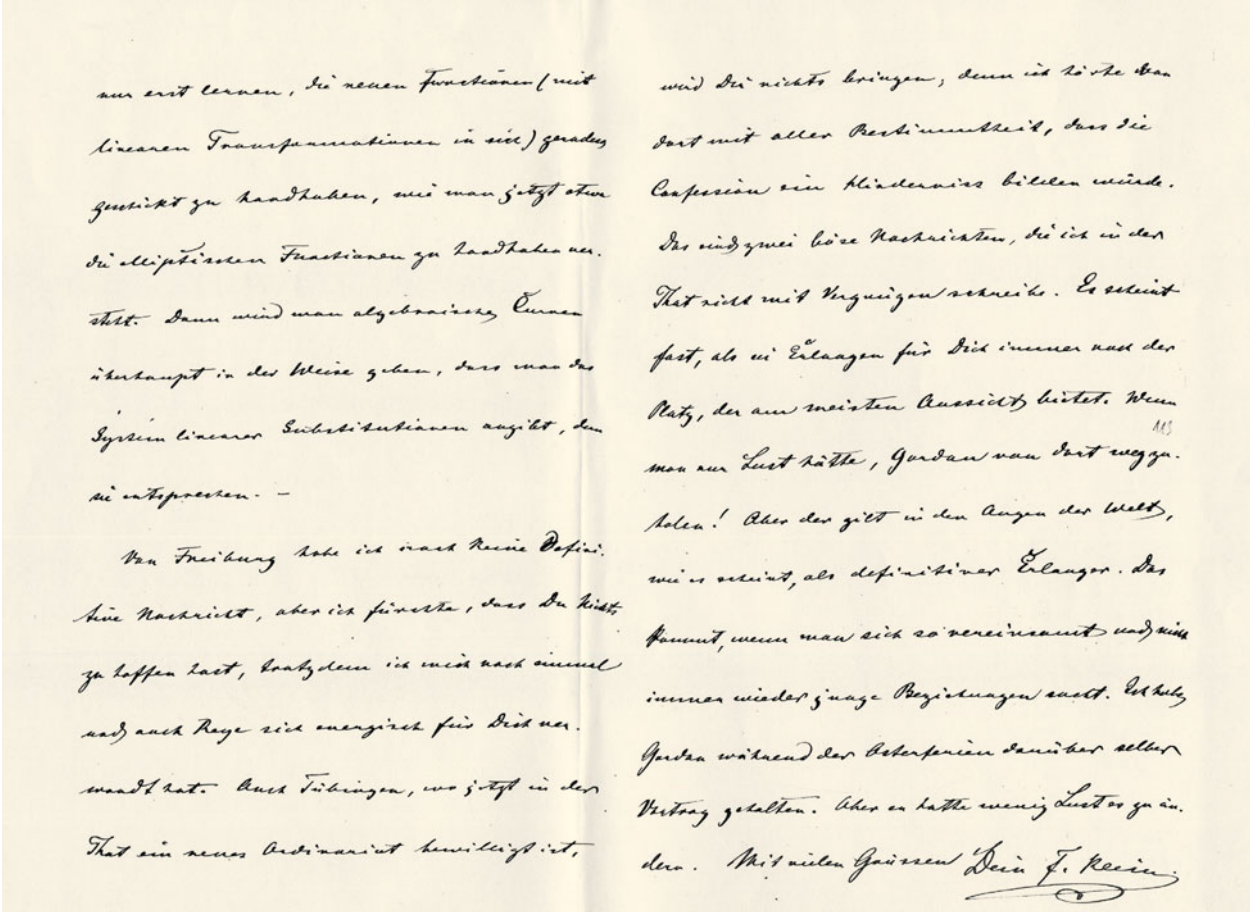
Minkowski als Ihren Nachfolger anzusehen, erscheint auch mir das natürlichste. Wenn Althoff wirklich die gleichen Ansichten

Letter from Ferdinand Lindemann to David Hilbert, 1 January 1895



Bringing in Minkowski as your successor also appears to me to be the most natural thing. If Althoff really is of the same opinion, then who else you put on the list would be quite unimportant. But it still seems possible to me that he objects to the Jewishness; at least he once said to me (regarding Hurwitz's appointment to Königsberg) that there were hardly any reservations about Jews as Extraordinarius but that the situation would be different in the case of full professorships. That said, Althoff's views may also change!

Appointment processes did not always end so favorably. Felix Klein's extensive correspondence, which has been preserved, provides examples of statements from the Wilhelmine Empire and the Weimar Republic confirming the persistence of anti-Semitic stereotypes and the strength of the negative attitudes to Jewish mathematicians in academic milieus. With regard to a potential appointment of Max Noether at Freiburg University, for instance, Klein wrote in 1883 that unfortunately "denomination" would probably be a factor hampering Noether's appointment.



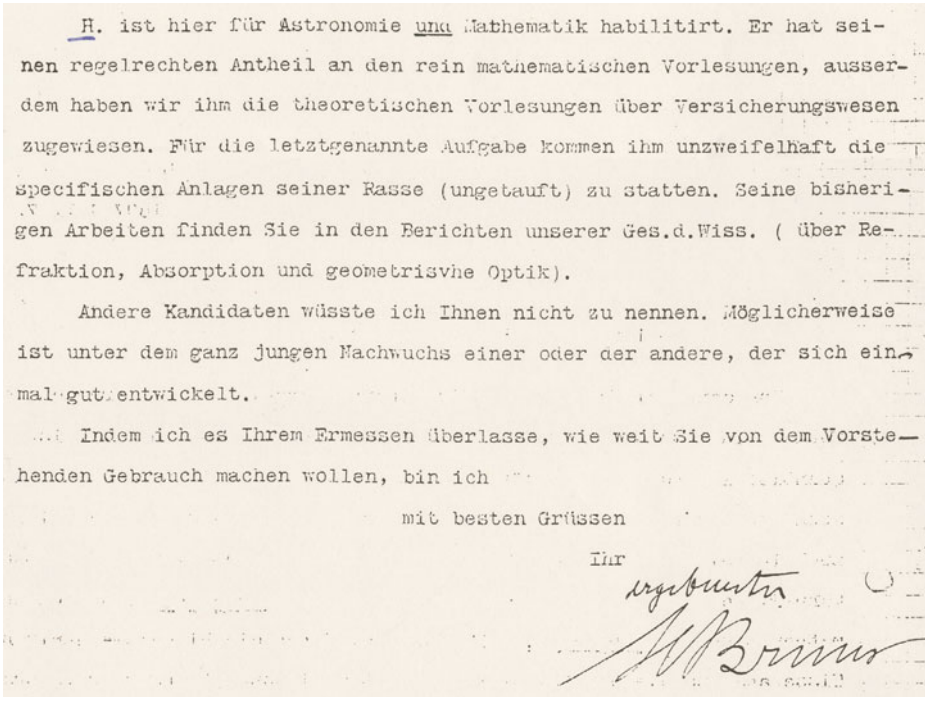
nur erst lernen, die neuen Functionen (mit linearen Transformationen in sich) gradezu gestickt zu handhaben, wie man jetzt etwa die elliptischen Functionen zu handhaben versteht. Dann wird man algebraischen Curven überhaupt in der Weise gehen, dass man das System linearer Substitutionen angibt, den sie entsprechen. –

Von Freiburg habe ich noch keine Definitive Nachricht, aber ich fürchte, dass Du Dich zu lassen hast, trotzdem ich mich noch einmal und auch Rage sich energisch für Dich verwandt hat. Auch Tübingen, wo jetzt in der That ein neues Ordinariat bewilligt ist, wird Dir nichts bringen, denn ich höre dort mit aller Bestimmtheit, dass die Confession ein Hinderniss bilden würde. Das sind zwei böse Nachrichten, die ich in der That nicht mit Vergnügen schreibe. Es scheint fast, als ob Erlangen für Dich immer noch der Platz, der am meisten Aussicht bietet. Wenn man nur Zeit hätte, Gordan von dort wegzuholen! Aber der gilt in den Augen der Welt, wie es scheint, als definitiver Erlanger. Das kommt, wenn man sich so verewigt und sich immer wieder einzelne Beziehungen macht. Ich habe Gordan während der Ueberpension darüber selber Vortrag gehalten. Aber es hatte wenig Lust es zu ändern. Mit vielen Grüssen Dein F. Klein

Letter from Felix Klein to Max Noether, 29 May 1883

Another case in which anti-Semitic motives contributed to preventing an appointment was presented in the essay on Göttingen in this volume: it concerned the chances of a professorship for Adolf Hurwitz in Göttingen.

The assessment of the young Felix Hausdorff by his academic mentor, Heinrich Bruns, professor for astronomy in Leipzig, when a professorship in astronomy was offered at the University of Göttingen in 1897, provides a further example of the presence of anti-Semitic motives in academic proceedings.



H. ist hier für Astronomie und Mathematik habilitirt. Er hat seinen regelrechten Antheil an den rein mathematischen Vorlesungen, ausserdem haben wir ihm die theoretischen Vorlesungen über Versicherungswesen zugewiesen. Für die letztgenannte Aufgabe kommen ihm unzweifelhaft die specifischen Anlagen seiner Rasse (ungetauft) zu statten. Seine bisherigen Arbeiten finden Sie in den Berichten unserer Ges.d.Wiss. (über Refraktion, Absorption und geometrisvhe Optik).

Andere Kandidaten wüsste ich Ihnen nicht zu nennen. Möglicherweise ist unter dem ganz jungen Nachwuchs einer oder der andere, der sich einmal gut entwickelt.

Indem ich es Ihrem Ermessen überlasse, wie weit Sie von dem Vorstehenden Gebrauch machen wollen, bin ich

mit besten Grüssen

Ihr

ergebenster

H Bruns

Letter from Heinrich Bruns to Felix Klein, 7 July 1897

H. is habilitated to teach astronomy and mathematics here. He regularly contributes to the lectures in pure mathematics; in addition we have entrusted him with the theoretical lectures on actuarial science. The specific hereditary disposition of his race (unchristened) is undoubtedly an advantage for the latter task. The work he has done so far may be found in the reports published by our scientific society (on refraction, absorption and geometrical optics).

I would not be able to name any other candidates. Among the very young academics, there could be one or the other who may develop into something.

How you decide to make use of the above is left to your own discretion.

Best regards
Yours faithfully

H. Bruns

As can be seen from the reference letter sent to Klein, even the teaching activities of a Jewish Privatdozent were critically examined. In the end, the theoretical astronomer Martin Brendel obtained the professorship at Göttingen instead of Hausdorff.

In the Weimar period, Felix Klein found it necessary to warn Otto Toeplitz, his former student and then professor at the University of Kiel, not to demonstrate "Jewish solidarity" in an appointment list for a professorship where all five candidates were Jewish.[9] Note that even these remarks reflect old stereotypes:

"In order to withhold nothing, I now come to the question of anti-Semitism. You know how I have dealt with it myself since 1874, when I arranged Gordan's appointment at Erlangen: for me the individual Jew was welcome because I presupposed that he would cooperate with the other members of the university. However, contradictory positions have intensified drastically in the course of time: on the one hand we have not only the enormous advance of Jews as a result of their peculiar ability, but also the fact of Jewish solidarity (where Jews in every way seek to help and support their clansmen). And, in reaction to this, we have rigid anti-Semitism on the other side. This is a universal problem in which Germany merely plays a secondary role, if we leave the new immigration from the East out of consideration. No one can say how things will develop.

But I want to bring your attention to the fact that all five scholars whom you have under consideration for your full professorship are of Jewish origin. Is this a suitable strategy? I assume that you did not do this intentionally. One could also almost argue that the flourishing of anti-Semitism at all universities has given Christian candidates such an advantage that only Jewish candidates remain. But I ask you, please, to think about it again. We are potentially entering into conflicts that could become disastrous for our situation as a whole."

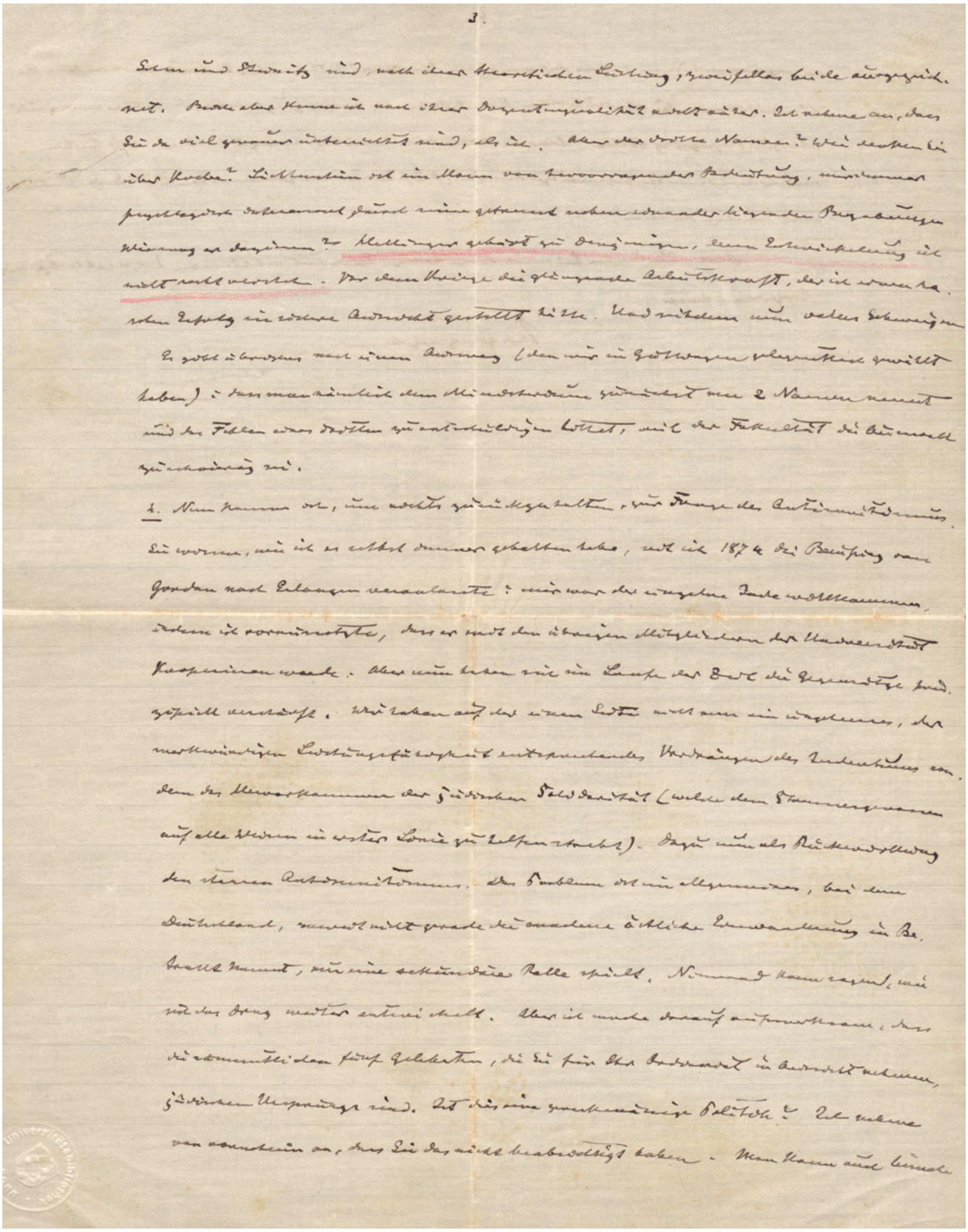
At about the same time, Edmund Landau made the following ironic remark in a letter to Toeplitz, his friend of long standing: "In order to make sure your list is not racially pure, I would suggest putting two capable Aryans (even if they might be unavailable) on the list. [The ministry official] should, says Courant, clearly perceive that mathematics lists now can, or rather must be, racially pure, since the Aryans are taken care of."[10]

Berlin State Library flying Nazi flags

The passages quoted above illustrate that academic anti-Semitism never fully disappeared in the years before 1933. However, the extent to which anti-Semitic motives continued to play a role in appointments requires further research.

9 See Felix Klein to Otto Toeplitz, 4 February 1920, excerpted in (Toeplitz 1999: 140).

10 Edmund Landau to Otto Toeplitz, early 1920, in (Toeplitz 1999: 141).



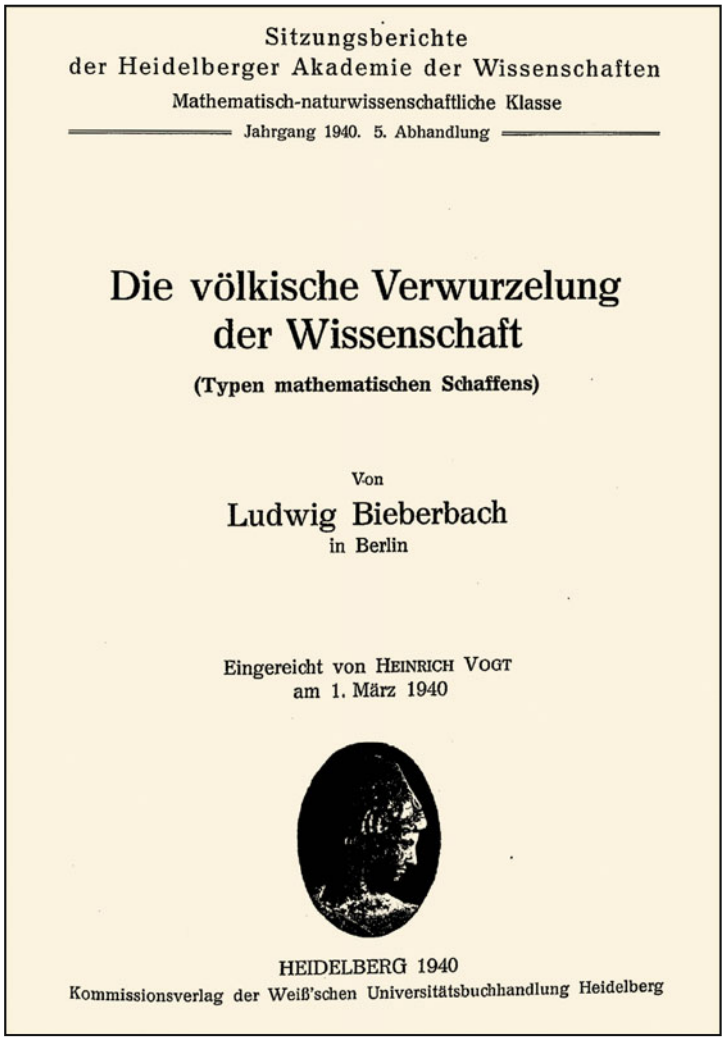
Excerpt of a letter from Felix Klein to Otto Toeplitz, 4 February 1920, regarding an appointment list

Official anti-Semitism and denunciation

After 30 January 1933, anti-Semitism gradually became the law of the land. Observing the removal of their Jewish colleagues, "Aryan" mathematicians were faced with a choice: tolerate injustice, profit from it and serve the new rulers, or help the persecuted.

The renowned function theorist Ludwig Bieberbach (1886-1982), co-editor of *Jahresberichte der DMV*, who was also Dean of the Faculty of Mathematics and Natural Sciences at Berlin University from 1936 to 1945, published several articles with seemingly harmless titles, such as "Stilarten mathematischen Schaffens" [Styles of mathematical work] (1934) and "Typen mathematischen Schaffens" [Types of mathematical work] (1940).[11] In these papers he made a racially-motivated distinction between "Aryan" and "non-Aryan" mathematics and created the myth of "German mathematics". The first publication caused an international scandal in the mathematical world.[12] Considering that Bieberbach was acutely aware of the close cooperation between Jewish and non-Jewish mathematicians, his polemic cannot be excused by stupidity or as an extreme but acceptable view. It represented nothing less than an open attack on his colleagues, including some who had helped him in his own career.

The Munich teacher and historian of mathematics Kurt Vogel (1888-1985) joined the ranks of Nazi propagandists in 1939 when he claimed, against his better knowledge, that Jewish mathematicians had made no valuable contribution worth mentioning to the development of mathematics before 1800.[13]


Sitzungsberichte
der Heidelberger Akademie der Wissenschaften
Mathematisch-naturwissenschaftliche Klasse
Jahrgang 1940. 5. Abhandlung

Die völkische Verwurzelung der Wissenschaft

(Typen mathematischen Schaffens)

Von
Ludwig Bieberbach
in Berlin

Eingereicht von HEINRICH VOGT
am 1. März 1940

HEIDELBERG 1940
Kommissionsverlag der Weiß'schen Universitätsbuchhandlung Heidelberg

Bieberbach's "Die völkische Verwurzelung der Wissenschaft" [The national and racial roots of science], 1940. This lecture echoed the anti-Semitic polemic of his text "Stilarten mathematischen Schaffens" [Styles of mathematical work] of 1934

11 See (Bieberbach 1934, 1940).
12 On Bieberbach and international reactions to Deutsche Mathematik see (Mehrtens 1986).
13 (Vogel 1939).

An anti-Semitic text written by Kurt Vogel published in: *Zeitschrift für die gesamte Naturwissenschaften* 5 (1939), pp. 27–28

Berichte und Mitteilungen

Mathematik und Judentum

Von Dozent Dr. K. Vogel, München

In einem in dieser Zeitschrift auszugsweise wiedergegebenen Vortrag[1]) wurde u. a. dargelegt, daß die Juden im Altertum auf dem Gebiet der Mathematik keinerlei bedeutende Leistungen aufzuweisen haben und daß sie auch später an der Weiterbildung der alten und der Schöpfung der modernen Mathematik vor dem 19. Jahrhundert wesentlich nicht beteiligt waren. Zur Ergänzung dieser Feststellungen möchte ich auf ein im Jahre 1931 in London erschienenes Werk von W. M. Feldman: „Rabbinical mathematics and astronomy"[2]) aufmerksam machen, in dem der Verfasser zu demselben Gesamturteil kommt. Schon im Vorwort hebt R. A. Sampson hervor, daß die Juden sich weder für Mathematik noch eine andere Naturwissenschaft interessierten; dies stimmt ganz mit dem Urteil Renans überein, der sie als antiphilosophisch und antiwissenschaftlich bezeichnete[3]). Feldman führt im einzelnen aus, daß es sich dort um eine magere, nur aufs Praktische gerichtete Arithmetik und Geometrie handelt und daß keine eigene jüdische Leistung in der Theorie der Mathematik nachgewiesen werden kann. Im Schlußwort wird dieses Urteil unter Bezugnahme auf einen Ausspruch Voltaires[4]) nochmals unterstrichen: „One cannot help agreeing with Voltaire, that, with the exception of Hygiene and Public Health foundet by Moses, the foundations of these sciences were laid without Jewish co-operation."

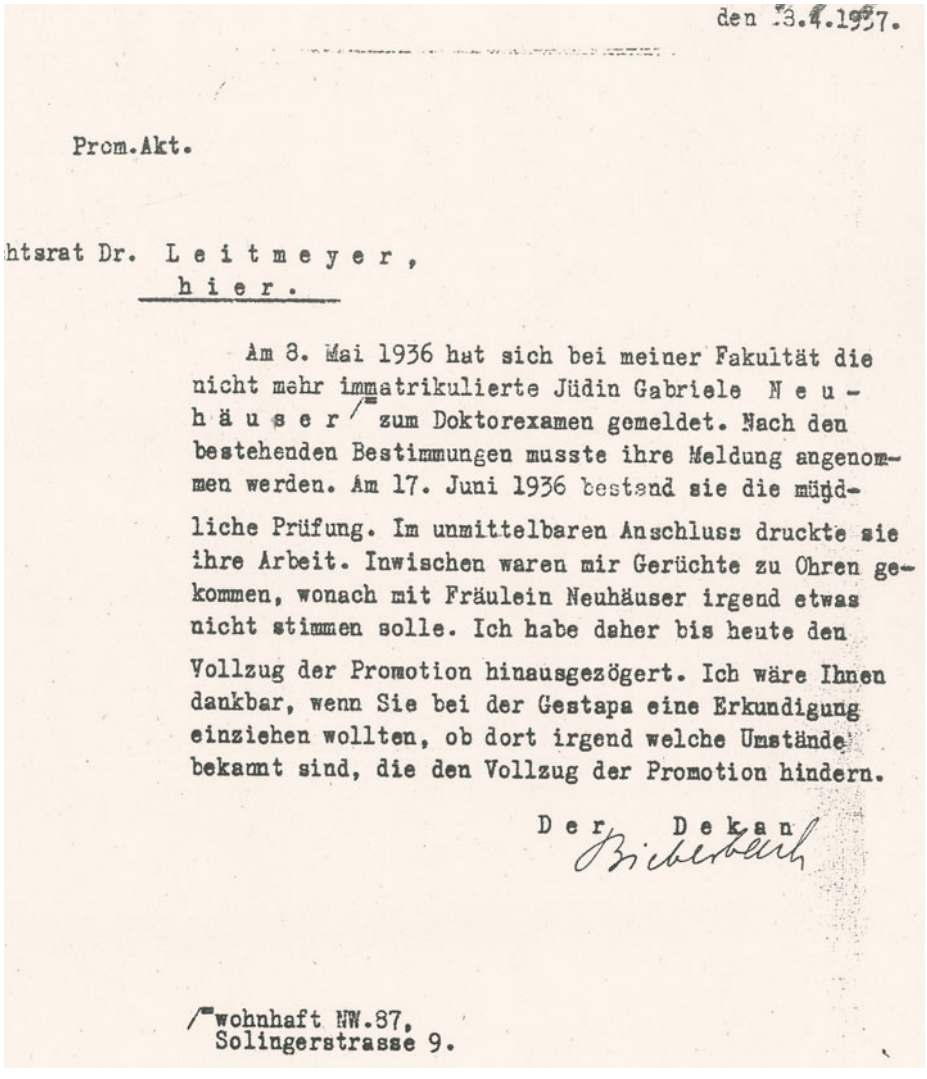
Eine andere, exakt belegte Arbeit aus dem Jahre 1936 von A. Masotti: „Astronomia biblica"[5]) beschäftigt sich eingehend mit der Astronomie des alten Testaments. Auf Schiaparelli fußend[6]) untersucht Verf. alle Bibelstellen, die sich mit astronomischen Dingen befassen, wobei er zu dem klaren Ergebnis kommt, daß die Bibel recht wenig Astronomie enthält. Trotzdem ist er der Ansicht, daß die astronomischen Kenntnisse weit ausgedehnter gewesen sein müssen. Da dafür direkte Beweise nicht beigebracht werden können, werden Bibelstellen angeführt, die wenigstens das Interesse an astronomischen Fragen dartun sollen. Mit solchen Stellen, wie sie z. B. aus dem 19. Psalm („Die Himmel rühmen die Ehre Gottes") oder aus dem an sich umstrittenen apokryphen Buch der Weisheit angeführt werden, läßt sich freilich recht wenig für eine wissenschaftliche Beschäftigung der Juden mit Astronomie beweisen.

Begnügt man sich nicht mit der bloßen Feststellung dieser Tatsachen, sondern will man den Gründen für die verschieden gearteten Leistungen der Völker nachgehen, so muß man zu dem Schluß kommen, daß die verschiedene Veranlagung der Rassen das Maßgebende ist. Dies hat erst kürzlich G. Sarton[7]) für die Völker um das Mittelmeer eindringlich betont: „The diversity proves the reality of racial genius." Für alle Mittelmeeranlieger waren Landschaft und Lebensbedingungen die gleichen, der Genius aber wohnte allein in Griechenland[8]).

[1]) Zeitschr. f. d. ges. Naturwiss. 2, 88—93 (1937).
[2]) London, Cailingold 1931, XVIII, 232 S.

Bieberbach was not only a propagandist for a movement of "German mathematics" and editor of the movement's new journal *Deutsche Mathematik* [German mathematics], but also a denunciator. In early 1937, as Dean of the Faculty for Mathematics and Natural Sciences, he attempted to prevent the doctoral student Gabriele Neuhäuser (born in Berlin on 11 May 1911) from completing her doctoral thesis on a zoological topic by informing on her to the Gestapo.[14] She nevertheless managed to escape to Australia.[15]

14 See dissertation file, in: Archiv Humboldt Universität Berlin, Mathematisch-Naturwissenschaftliche Fakultät Nr. 118, List 163–189.
15 See (Vogt 1997: 93).



den 13.4.1937.

Prom.Akt.

htsrat Dr. L e i t m e y e r ,
h i e r .

Am 8. Mai 1936 hat sich bei meiner Fakultät die nicht mehr immatrikulierte Jüdin Gabriele N e u - h ä u s e r zum Doktorexamen gemeldet. Nach den bestehenden Bestimmungen musste ihre Meldung angenommen werden. Am 17. Juni 1936 bestand sie die mündliche Prüfung. Im unmittelbaren Anschluss druckte sie ihre Arbeit. Inwischen waren mir Gerüchte zu Ohren gekommen, wonach mit Fräulein Neuhäuser irgend etwas nicht stimmen solle. Ich habe daher bis heute den Vollzug der Promotion hinausgezögert. Ich wäre Ihnen dankbar, wenn Sie bei der Gestapa eine Erkundigung einziehen wollten, ob dort irgend welche Umstände bekannt sind, die den Vollzug der Promotion hindern.

D e r D e k a n
Bieberbach

wohnhaft NW.87,
Solingerstrasse 9.

Letter from Ludwig Bieberbach, 18 April 1937

18 April 1937

Doctoral file
Member of the Supervisory Board Dr Leitmeyer
here.

On 8 May 1936 the no-longer enrolled Jewess Gabriele Neuhäuser /* applied to take the doctoral examination at my faculty. In compliance with existing regulations, this application had to be accepted. She passed the oral examination on 17 June 1936. She had her dissertation printed immediately afterwards. Meanwhile I have heard rumors according to which something is not quite right about Miss Neuhäuser. I have therefore, until now, delayed granting her the doctoral degree. I would be much obliged if you could make an inquiry at the Gestapa (sic) as to whether they are aware of any special circumstances which could possibly impede processing the award of the doctorate.

The Dean
Bieberbach

/* residing at Solingerstrasse 9, NW. 87.

The year before, Bieberbach had denounced his colleague Issai Schur, who had just been dismissed from the university. Both were still members of the Prussian Academy of Sciences. Schur was forced into retirement at the end of 1935 due to the so-called Nuremberg Laws. In February 1936 he spent some time in Zurich, where he held a series of lectures on "Die algebraischen Grundlagen der Darstellungstheorie der Gruppen" [The algebraic foundations of the representation theory of groups] at the invitation of the mathematics department of Eidgenossische Technische Hochschule Zürich (ETH). These lectures were published in Zurich later the same year (with some modifications made by Schur's assistant Eduard Stiefel). On 20 February 1936, the Dean of the faculty, Bieberbach, wrote to the Minister of Education: "Attached I present you a communication that has reached me from Zurich according to which a retired professor from my faculty, Dr. I. Schur, held a series of lectures there in February. Since I am not aware of any authorization for these guest lectures, I would like to ask whether this authorization was perhaps applied for and issued through another route."[16] As a result of this denunciation, the minister informed Bieberbach that Schur had filed an "application for permission for a lecture trip to Zurich" on 6 January 1936 and that this had been approved on 23 January.[17]

***

In a January 1964 television interview, Hannah Arendt said on the subject of Nazi race theories: "There have been many attempts to trace National Socialism back to the depths of Germany's, and even Europe's, intellectual past. I consider such attempts mistaken and even pernicious, because they argue away the phenomenon's most conspicuous hallmark, its utter shallowness. That something can be born in the gutter and despite its lack of depth at the same time gain power over almost everyone – that is what makes the phenomenon so frightening."[18]

Regarding the so-called apologies of the offenders and their refusal to acknowledge any guilt, a worried Arendt adds in the same interview: "It has been my experience that all the Germans who have never done the least harm in all their lives constantly insist on talking about how guilty they feel, whereas if you run into an ex-Nazi you are confronted with the clearest conscience in the world – even if he is not lying to you outright and using his clear conscience as camouflage".[19]

How various mathematicians during the Nazi period reacted to the racist anti-Semitism of the state or of their colleagues, or simply to anti-Semitism as they encountered it in day-to-day life, remains an open question. Who spoke openly against the dismissals of Jewish colleagues? Who helped expelled colleagues who had lost their livelihood and were struggling to survive? Who suggested that these colleagues should return to their academic institutions after May 1945?

Annette Vogt

16 Ludwig Bieberbach letter to REM, 20.2.1936, in: Archiv Humboldt Universität Berlin, personal file I. Schur, PA Nr. 342, vol. 3, list 2.

17 Letter from the REM to Ludwig Bieberbach, 18.3.1936, in: Ibid., vol.3, list 2. On Issai Schur's dismissal from Berlin University and the Berlin Academy, see (Vogt 1999).

18 Hannah Arendt, interview with Thilo Koch for the program "Panorama", taped in New York, 24 January 1964; quoted in (Arendt 2007: 487).

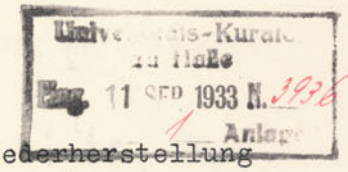
19 (Arendt 2007: 488).

Berlin University during the Nazi years

Der Preußische Minister
für Wissenschaft, Kunst und
Volksbildung

U I Nr 13117

Berlin W 8 den 7. September 1933.
- Postfach -



Auf Grund von § 3 des Gesetzes zur Wiederherstellung des Berufsbeamtentums vom 7. April 1933 entziehe ich Ihnen hiermit die Lehrbefugnis an der Universität Halle-Wittenberg.

Berlin den 7. September 1933.
(Siegel)
Der Preußische Minister für Wissenschaft,
Kunst und Volksbildung
In Vertretung
gez. S t u c k a r t.

An den Privatdozenten Herrn Dr.Reinhold Baer in Halle a.S.

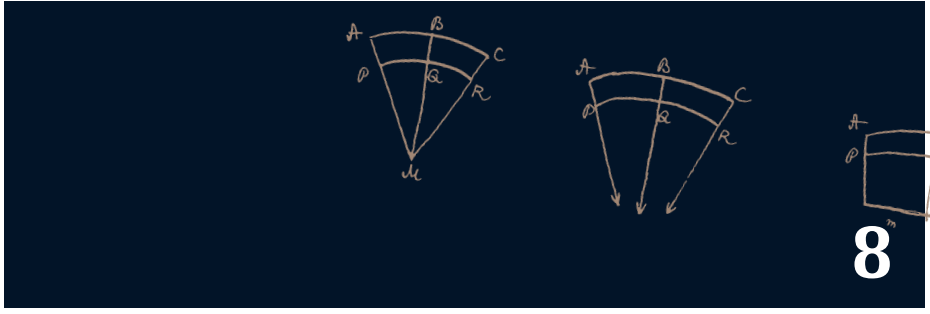
- - - - - - - - - - - - -

Abschrift zur Kenntnis und weiteren Veranlassung.
Die bisherigen Bezüge sind mit Ende September 1933 endgültig in Abgang zu stellen.
Den anliegenden Erlaß ersuche ich dem Dr.Baer gegen Postzustellungsurkunde zustellen zu lassen.
In Vertretung
gez. S t u c k a r t.

An
den Herrn Universitätskurator
in
H a l l e a.S.

Beglaubigt.
Ministerial-Kanzleisekretär.

z. d. Baer, z. 81



8

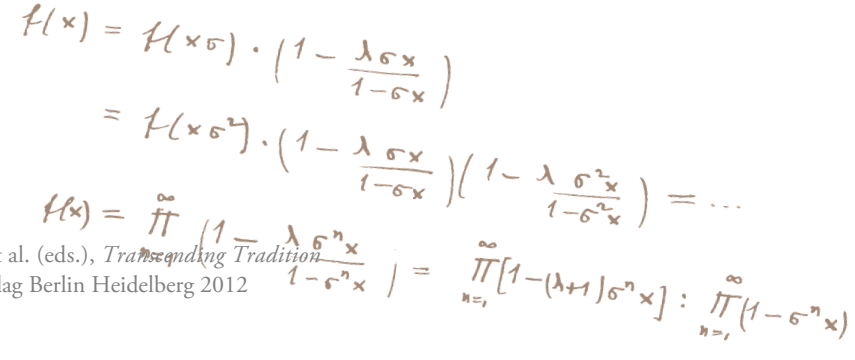
Letter from the Preußische Minister für Wissenschaft, Kunst und Volksbildung [Prussian minister for science, art and education of the people] announcing the dismissal of Reinhold Baer, 7 September 1933: "Based on § 3 of the Law for the Restoration of the Professional Civil Service, dated 7 April 1933, I hereby withdraw your permission to teach at the University of Halle-Wittenberg [...] Previously received remunerations shall be ceased by the end of September 1933[...]".

Dismissal and Exile

Charlotte Auerbach (1899-1994), a research fellow in genetics at the Kaiser Wilhelm Institute for Biology in Berlin Dahlem who emigrated in 1933, later told friends and colleagues: "Thanks to Hitler I became a scientist."[1]

The physicist Lise Meitner, more than 20 years older than Auerbach, Scientific Member and head of the department for radioactivity of the Kaiser Wilhelm Institute for Chemistry in Berlin Dahlem, fled into exile in July 1938. In a letter written from Stockholm on 29 October 1938 she wrote to a friend: "Of course I miss my books very much, and not only the scientific ones.... [I] am trying to develop a closer relationship – scientifically and personally – with the Institute's assistants, and I am doing as much scientific work as possible; however, deep inside I know that at my age it would be a miracle if I managed to establish myself once again."[2]

What Auerbach and Meitner expressed in these sentences with regard to their own experiences of dismissal, flight and exile reflects the experiences of many scientists forced to leave Germany after early 1933, including the mathematicians.



1 Professor Raphael Falk in interviews with the author (1996, 1999).

2 Lise Meitner to Gertrud Schiemann, dated 29 October 1938, letters of Lise Meitner-Elisabeth Schiemann. Meitner-Nachlass, MTNR, 5/32, transcribed: Part 1: 1911-1939: 146-148, (Cambridge, Churchill College Archives). See (Lemmerich 2010).

B. Bergmann et al. (eds.), *Transcending Tradition*

Fragebogen

zur Durchführung des Gesetzes zur Wiederherstellung des Berufsbeamtentums vom 7. April 1933

(Reichsgesetzbl. I S. 175)

1. Name	Dr. Baer
Vornamen	Reinhold
Wohnort und Wohnung	z. Zt. ohne festen Wohnsitz
Geburtsort, -tag, -monat und -jahr	Berlin 22. VII. 1902
Konfession (auch frühere Konfession)	evang. [bis 1920 mosaisch]
2. Amtsbezeichnung	Privatdozent
3. § 2 des Gesetzes: a) Wann sind Sie in das Beamtenverhältnis eingetreten?	
Durch Ernennung zum	
Falls seit 9. November 1918: b) Haben Sie die für Ihre Laufbahn vorgeschriebene oder übliche Vorbildung*)	Ja, ich bin in Göttingen 19 zum Dr. ph. om. promoviert, ha mich 1926 in Freiburg i. Br. habilitiert und nach Halle u habilitiert.
oder	
c) sonstige Eignung*) besessen?	

*) Vorbildung und Eignung sind kurz zu begründen.

Like all civil servants, the mathematician Reinhold Baer was required to fill in the questionnaire reprinted on the following pages in order to comply with the so-called "Law for the Restoration of the Professional Civil Service", which resulted in his dismissal.

4. § 3 des Gesetzes:

a) Sind Sie bereits am 1. August 1914 Beamter gewesen und seitdem geblieben? Nein

In welcher Stellung?..... —

oder

b) Lagen am 1. August 1914 bei Ihnen die Voraussetzungen der Dritten Verordnung zur Durchführung des Gesetzes zur Wiederherstellung des Berufsbeamtentums vom 6. Mai 1933 (Reichsgesetzbl. I S. 245) zu § 3, Nr. 2 Satz 2, vor? Nein

oder

c) Haben Sie im Weltkrieg an der Front für das Deutsche Reich oder für seine Verbündeten gekämpft? Nein

oder

d) Sind Sie Sohn (Tochter) oder Vater eines im Weltkrieg Gefallenen? Nein

Falls nein zu a bis d:

e) Sind Sie arischer Abstammung im Sinne der Ersten Verordnung zur Durchführung des Gesetzes zur Wiederherstellung des Berufsbeamtentums vom 11. April 1933 (Reichsgesetzbl. I S. 195) zu § 3, Nr. 2 Abs. 1? Nein

(Nachweise zu 4c bis e gemäß der Ersten Verordnung zur Durchführung des Gesetzes zur Wiederherstellung des Berufsbeamtentums vom 11. April 1933 — Reichsgesetzbl. I S. 195 — zu § 3, Nr. 2 Abs. 2, sind beizufügen.)

Nähere Angaben über die Abstammung:

Eltern:

Name des Vaters ..... Baer

Vornamen ..... Emil

Stand und Beruf ..... Fabrikant

Wohnort und Wohnung ..... Berlin

Geburtsort, -tag, -monat und -jahr ..... 10. X. 1861 Kempen (Prov. Posen) (jetzt abgetreten)

Sterbeort, -tag, -monat und -jahr ..... 28. IV. 1917 Berlin

Konfession (auch frühere Konfession) ..... mosaisch

verheiratet { in ..... Berlin
am 28. 8. 1901

4H PA Nr. 4062 R. Baer

Geburtsname der Mutter	Timendorfer
Vornamen	Bianka
Geburtsort, -tag, -monat und -jahr	Berlin 30. III. 1875
Sterbeort, -tag, -monat und -jahr	—
Konfession (auch frühere Konfession)	mosaisch

Großeltern:

Name des Großvaters (väterlicherseits)	Baer
Vornamen	Jakob (?)
Stand und Beruf	Kaufmann
Wohnort	Kempen (Prov. Posen)
Geburtsort, -tag, -monat und -jahr	sind mir nicht bekannt
Sterbeort, -tag, -monat und -jahr	
Konfession (auch frühere Konfession)	mosaisch
Geburtsname der Großmutter (väterlicherseits)	Gallewski (?)
Vornamen	Charlotte
Geburtsort, -tag, -monat und -jahr	Kempen (Prov. Posen) Daten sind mir nicht bekannt
Sterbeort, -tag, -monat und -jahr	Berlin
Konfession (auch frühere Konfession)	mosaisch

Name des Großvaters (mütterlicherseits)	Timendorfer
Vornamen	Adolf
Stand und Beruf	Kaufmann
Wohnort	Berlin
Geburtsort, -tag, -monat und -jahr	Näheres ist mir nicht bekannt, nur dass er an den Kriegen 1864, 1866, 1870/71 als preußischer Soldat teilgenommen hat. mosaisch.
Sterbeort, -tag, -monat und -jahr	Berlin 1922
Konfession (auch frühere Konfession)	
Geburtsname der Großmutter (mütterlicherseits)	Lowy
Vornamen	Sarah
Geburtsort, -tag, -monat und -jahr	Oberschlesien
Sterbeort, -tag, -monat und -jahr	Berlin 1924
Konfession (auch frühere Konfession)	mosaisch.

5. **§ 4 des Gesetzes und Nr. 3 der Ersten Durchführungsverordnung vom 11. April 1933:**

a) Welchen politischen Parteien haben Sie bisher angehört? Von wann bis wann?*)

Ich habe keiner politischen Partei angehört.

b) Waren Sie Mitglied des Reichsbanners Schwarz-Rot-Gold, des republikanischen Richter- oder Beamtenbundes oder der Liga für Menschenrechte und, falls ja, von wann bis wann?*)

Nein.

*) Die Erklärungen zu 5a und b können in verschlossenem Umschlag beigefügt werden.

Hötz b. Innsbruck

Halle S., den 30. Juni 1933.

Unterschrift: Dr. Reinhold Baer

(Vor- u. Zuname)

4 PA No. 4062 R. Baer 2352

Persecution

Dismissals from schools, universities and the institutes of the Kaiser Wilhelm Society (today the Max Planck Society) began at Easter 1933. Once the so-called "Law for the Restoration of the Professional Civil Service" had been passed on 7 April 1933, political opponents – members of the German Communist Party (KPD), the Social Democratic Party (SPD) or socialist splinter parties – and all those who were "non-Aryan" according to the Nazi definition were dismissed not only from the civil service but from all positions in public institutions in general. At the universities, this law affected not only the – non-tenured – Extraordinarien and other lecturers, but also assistants, secretaries and laboratory assistants. The racist definition of "non-Aryans" included all those who had at least one Jewish grandparent. During the following two years, many additional ordinances were passed and only a few exceptions were made. Women and young scientists were the first to be dismissed because they did not belong to either large category of exceptions – those who had served in the military in World War I and those who had received professorships before 1914.[3]

A week earlier, on 1 April, the Nazis had organized a first boycott. Jewish-owned department stores and physicians' clinics had been surrounded by SA troops; "non-Aryans" had been thrown out of libraries, physicians prevented from operating in hospitals and professors kept out of their lecturing halls. Unfortunately, the slogans shouted on the street and the brutal actions of the Storm Troopers were only the beginning. Similar boycotts took place repeatedly in the following months.

Among the mathematicians who were attacked was Edmund Landau, whose lectures in Göttingen were disturbed by Nazi students in November 1933. One of the hecklers was Oswald Teichmüller (1913-1943), a gifted young mathematician and fervent member of the Nazi Party at the same time. The university suspended Landau, and he was forced into early retirement in 1934.[4]

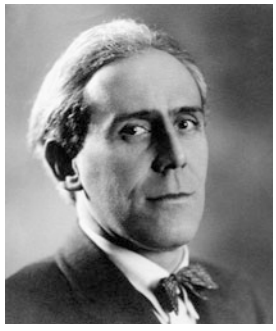
The mathematician and widely read left-wing political writer Emil Julius Gumbel (1891-1966), who had been dismissed from Heidelberg University as early as July 1932 due to his political opposition to the Nazi movement and now lived in exile in France, published several articles against the Nazis. In a 1936 article published in the literary journal *Das Wort* about the Gleichschaltung of German universities, he described the reaction of his former colleagues and of the German academics who still remained in office in unflattering but acutely realistic terms:

"In the face of these violent changes the Heidelberg professors, just like their colleagues all over the Reich, showed no fortitude. Not a word of protest was uttered against the removal from office of so many scholars of outstanding merit. Not a word of criticism against the invasion of ignorance armed with party books [i.e., of the NSDAP] [...]. The idea of the university, the idealism, the intellectual forces [...], all of this evaporated when it came down to their pension rights. The dignity of the academic corporation disintegrated. The absolute commitment that gave some pastors the strength to offer resistance was nowhere to be seen. Faced with the bitter choice of emigration with all its uncertainty or the prospect of drawing a beggar's pension, they chose what they considered to represent security. They did not think

3 On Berlin University see (Schottländer 1988) and (Jarausch 1995); on the Technische Hochschule Berlin see (Schottländer 1979); on Göttingen University see (Szabó 2000); on mathematicians see (Siegmund-Schultze 1998, 2009).

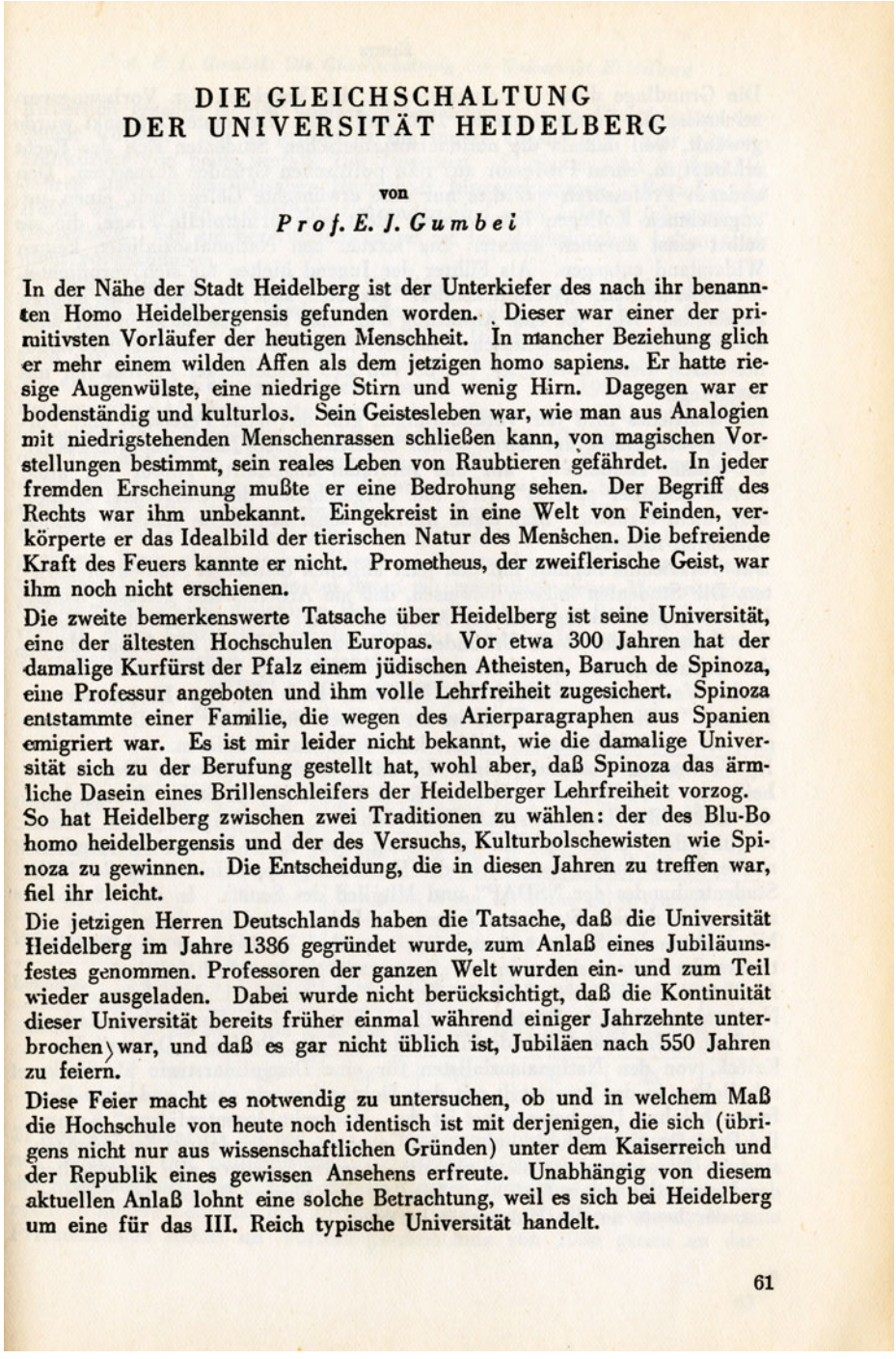
4 See (Schappacher 1987).

of what Spinoza had renounced or of the Göttingen Seven [here Gumbel refers to seven professors who defied an illiberal alteration of the constitution by the King of Hanover in 1837]. [....] A simple examination of the lecture program shows that Heidelberg University is no longer the university whose anniversary the Nazis are pretending to celebrate. Whoever believes they can ignore the fact that famous researchers were pushed aside by unknown local Nazis is denying the German university tradition. He is then in fact supporting those who have expelled 1,500 professors from German professorships and approving, perhaps unwittingly, the continuation of this campaign of destruction."[5]



Emil Julius Gumbel

Emil Julius Gumbel on the Gleichschaltung of the University of Heidelberg in the journal *Das Wort*, 3/1936



DIE GLEICHSCHALTUNG
DER UNIVERSITÄT HEIDELBERG

von

Prof. E. J. Gumbel

In der Nähe der Stadt Heidelberg ist der Unterkiefer des nach ihr benannten Homo Heidelbergensis gefunden worden. Dieser war einer der primitivsten Vorläufer der heutigen Menschheit. In mancher Beziehung glich er mehr einem wilden Affen als dem jetzigen homo sapiens. Er hatte riesige Augenwülste, eine niedrige Stirn und wenig Hirn. Dagegen war er bodenständig und kulturlos. Sein Geistesleben war, wie man aus Analogien mit niedrigstehenden Menschenrassen schließen kann, von magischen Vorstellungen bestimmt, sein reales Leben von Raubtieren gefährdet. In jeder fremden Erscheinung mußte er eine Bedrohung sehen. Der Begriff des Rechts war ihm unbekannt. Eingekreist in eine Welt von Feinden, verkörperte er das Idealbild der tierischen Natur des Menschen. Die befreiende Kraft des Feuers kannte er nicht. Prometheus, der zweiflerische Geist, war ihm noch nicht erschienen.

Die zweite bemerkenswerte Tatsache über Heidelberg ist seine Universität, eine der ältesten Hochschulen Europas. Vor etwa 300 Jahren hat der damalige Kurfürst der Pfalz einem jüdischen Atheisten, Baruch de Spinoza, eine Professur angeboten und ihm volle Lehrfreiheit zugesichert. Spinoza entstammte einer Familie, die wegen des Arierparagraphen aus Spanien emigriert war. Es ist mir leider nicht bekannt, wie die damalige Universität sich zu der Berufung gestellt hat, wohl aber, daß Spinoza das ärmliche Dasein eines Brillenschleifers der Heidelberger Lehrfreiheit vorzog.

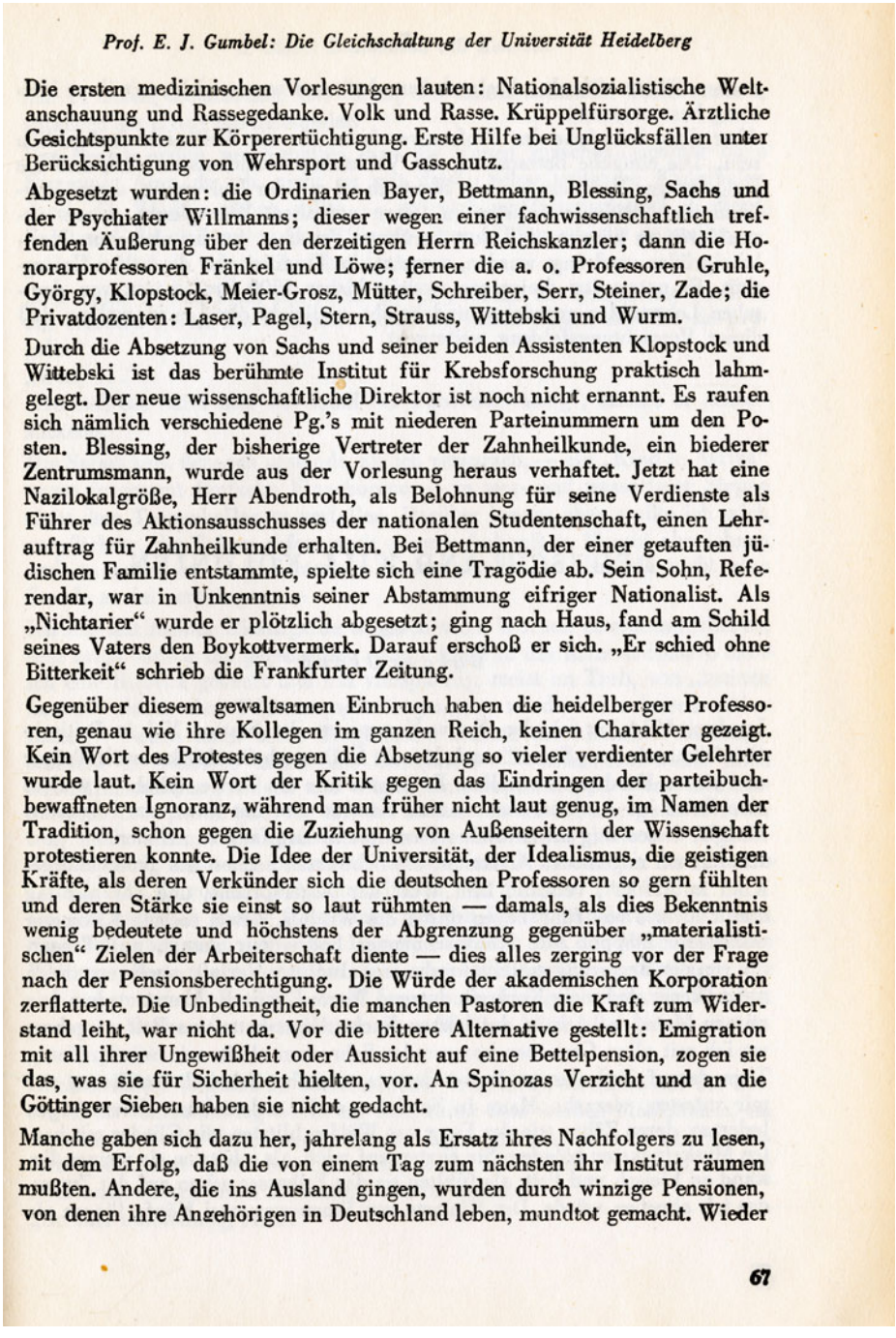
So hat Heidelberg zwischen zwei Traditionen zu wählen: der des Blu-Bo homo heidelbergensis und der des Versuchs, Kulturbolschewisten wie Spinoza zu gewinnen. Die Entscheidung, die in diesen Jahren zu treffen war, fiel ihr leicht.

Die jetzigen Herren Deutschlands haben die Tatsache, daß die Universität Heidelberg im Jahre 1386 gegründet wurde, zum Anlaß eines Jubiläumsfestes genommen. Professoren der ganzen Welt wurden ein- und zum Teil wieder ausgeladen. Dabei wurde nicht berücksichtigt, daß die Kontinuität dieser Universität bereits früher einmal während einiger Jahrzehnte unterbrochen war, und daß es gar nicht üblich ist, Jubiläen nach 550 Jahren zu feiern.

Diese Feier macht es notwendig zu untersuchen, ob und in welchem Maß die Hochschule von heute noch identisch ist mit derjenigen, die sich (übrigens nicht nur aus wissenschaftlichen Gründen) unter dem Kaiserreich und der Republik eines gewissen Ansehens erfreute. Unabhängig von diesem aktuellen Anlaß lohnt eine solche Betrachtung, weil es sich bei Heidelberg um eine für das III. Reich typische Universität handelt.

61

5 (Gumbel 1936: 67), [Gleichschaltung of the University of Heidelberg], cited in (Vogt 1991: 216-217). On Gumbel see (Jansen 1991) and (Vogt 2001) as well as (Brenner 1990, 1993, 2001) and (Hertz 1997).



Prof. E. J. Gumbel: Die Gleichschaltung der Universität Heidelberg

Die ersten medizinischen Vorlesungen lauten: Nationalsozialistische Weltanschauung und Rassegedanke. Volk und Rasse. Krüppelfürsorge. Ärztliche Gesichtspunkte zur Körperertüchtigung. Erste Hilfe bei Unglücksfällen unter Berücksichtigung von Wehrsport und Gasschutz.

Abgesetzt wurden: die Ordinarien Bayer, Bettmann, Blessing, Sachs und der Psychiater Willmanns; dieser wegen einer fachwissenschaftlich treffenden Äußerung über den derzeitigen Herrn Reichskanzler; dann die Honorarprofessoren Fränkel und Löwe; ferner die a. o. Professoren Gruhle, György, Klopstock, Meier-Grosz, Mütter, Schreiber, Serr, Steiner, Zade; die Privatdozenten: Laser, Pagel, Stern, Strauss, Wittebski und Wurm.

Durch die Absetzung von Sachs und seiner beiden Assistenten Klopstock und Wittebski ist das berühmte Institut für Krebsforschung praktisch lahmgelegt. Der neue wissenschaftliche Direktor ist noch nicht ernannt. Es raufen sich nämlich verschiedene Pg.'s mit niederen Parteinummern um den Posten. Blessing, der bisherige Vertreter der Zahnheilkunde, ein biederer Zentrumsmann, wurde aus der Vorlesung heraus verhaftet. Jetzt hat eine Nazilokalgröße, Herr Abendroth, als Belohnung für seine Verdienste als Führer des Aktionsausschusses der nationalen Studentenschaft, einen Lehrauftrag für Zahnheilkunde erhalten. Bei Bettmann, der einer getauften jüdischen Familie entstammte, spielte sich eine Tragödie ab. Sein Sohn, Referendar, war in Unkenntnis seiner Abstammung eifriger Nationalist. Als „Nichtarier" wurde er plötzlich abgesetzt; ging nach Haus, fand am Schild seines Vaters den Boykottvermerk. Darauf erschoß er sich. „Er schied ohne Bitterkeit" schrieb die Frankfurter Zeitung.

Gegenüber diesem gewaltsamen Einbruch haben die heidelberger Professoren, genau wie ihre Kollegen im ganzen Reich, keinen Charakter gezeigt. Kein Wort des Protestes gegen die Absetzung so vieler verdienter Gelehrter wurde laut. Kein Wort der Kritik gegen das Eindringen der parteibuchbewaffneten Ignoranz, während man früher nicht laut genug, im Namen der Tradition, schon gegen die Zuziehung von Außenseitern der Wissenschaft protestieren konnte. Die Idee der Universität, der Idealismus, die geistigen Kräfte, als deren Verkünder sich die deutschen Professoren so gern fühlten und deren Stärke sie einst so laut rühmten — damals, als dies Bekenntnis wenig bedeutete und höchstens der Abgrenzung gegenüber „materialistischen" Zielen der Arbeiterschaft diente — dies alles zerging vor der Frage nach der Pensionsberechtigung. Die Würde der akademischen Korporation zerflatterte. Die Unbedingtheit, die manchen Pastoren die Kraft zum Widerstand leiht, war nicht da. Vor die bittere Alternative gestellt: Emigration mit all ihrer Ungewißheit oder Aussicht auf eine Bettelpension, zogen sie das, was sie für Sicherheit hielten, vor. An Spinozas Verzicht und an die Göttinger Sieben haben sie nicht gedacht.

Manche gaben sich dazu her, jahrelang als Ersatz ihres Nachfolgers zu lesen, mit dem Erfolg, daß die von einem Tag zum nächsten ihr Institut räumen mußten. Andere, die ins Ausland gingen, wurden durch winzige Pensionen, von denen ihre Angehörigen in Deutschland leben, mundtot gemacht. Wieder

67

Gleichschaltung
of the University of Heidelberg

by
Prof. E. J. Gumbel

It was near the town of Heidelberg that the lower jaw of Homo Heidelbergensis, who was named after the town, was found. Homo Heidelbergensis was one of the most primitive precursors of today's human race. In many respects he more resembled a wild ape than today's homo sapiens. He had an enormous brow, a low forehead and a small brain. He was rooted to the

soil and uncultured. His spiritual life was, as may be inferred from analogies with lower human races, dominated by magical notions; his physical life was threatened by predators. Anything unfamiliar frightened him. The notion of law was foreign to him. Surrounded by a world of enemies, he embodied the ideal of the animal nature of man. He did not know the liberating power of fire. Prometheus, the doubting spirit, had not yet appeared to him.

The second remarkable fact about Heidelberg is its university, one of the oldest in Europe. Around 300 years ago, the Palatine Elector offered a professorship to a Jewish atheist, Baruch de Spinoza, and promised him full academic freedom. Spinoza came from a family who had emigrated from Spain as a result of the Aryan Paragraph. I unfortunately do not know what the university in those days thought of the appointment, but I do know, however, that Spinoza chose the humble existence of a lens grinder over academic freedom in Heidelberg. Thus, Heidelberg has two traditions to choose from: the blood-and-soil Homo Heidelbergensis and the attempt to attract cultural Bolshevists like Spinoza. The decision that had to be taken in recent years was an easy one.

The present rulers of Germany have used the fact that the University of Heidelberg was founded in the year 1386 as an opportunity to celebrate an anniversary. Professors from around the world have been invited, and some soon disinvited. The organizers have failed to consider that some time ago the continuity of this university was interrupted for several decades, and that it is not customary at all to celebrate anniversaries after 550 years.

This celebration calls for an investigation of whether and to what extent today's university is still identical to the institution that enjoyed a certain reputation under the Empire and the Republic (and not only for scientific reasons, by the way). This investigation is worthwhile regardless of the present occasion, as Heidelberg as a university is typical of Third Reich universities. [...]

The first series of lectures in medicine are entitled: National Socialist ideology and the notion of race. Nation and race. The welfare of cripples. Medical aspects of physical training. First aid in case of accidents related to military exercises and protection from gas attacks.

The following persons have been removed from office: full professors Bayer, Bettmann, Blessing, Sachs and the psychiatrist Willmanns, the latter in consequence of a scientifically apt remark about the present Reich Chancellor; next, honorary professors Fränkel and Löwe; furthermore, extraordinariate professors Gruhle, György, Klopstock, Meier-Grosz, Mütter, Schreiber, Serr, Steiner and Zade; and Privatdozenten Laser, Pagel, Stern, Strauss, Wittebski and Wurm.

The removal from office of Sachs and his two assistants Klopstock and Wittebski has left the famous Cancer Research Institute virtually incapacitated.

A new scientific director has not been appointed yet. There are various Nazi party members with low party numbers fighting over the position. Blessing, the former head of dentistry and a conservative member of the Center Party, was arrested in the middle of a lecture. Now a local Nazi bigwig, Mr. Abendroth, has been given a lectureship for dentistry in reward for services rendered as leader of the action committee of the national students' body. There was a tragedy at Bettmann's, who comes from a converted Jewish family. His son, a junior lawyer and unaware of his descent, was an enthusiastic nationalist. As a "non-Aryan" he was abruptly removed from office; he went home, found the boycott sign on his father's nameplate, and shot himself. "He departed this life without bitterness", reported the Frankfurter Zeitung newspaper.

In the face of these violent changes the Heidelberg professors, just like their colleagues all over the Reich, showed no fortitude. Not a word of protest was uttered against the removal from office of so many scholars of outstanding merit. Not a word of criticism against the invasion of ignorance armed with party books, whilst in the past they protested in the strongest of terms, in the name of tradition, even against the appointment of academic outsiders. The idea of the university, the idealism, the intellectual forces that German professors once so gladly claimed to spearhead and the strength of which they once praised so loudly – in the days when such declared belief was of little significance and mainly allowed them to distance themselves from the "materialistic" goals of the working class – all of this evaporated when it came down to their pension rights. The dignity of the academic corporation disintegrated. The absolute commitment that gave some pastors the strength to offer resistance was nowhere to be seen. Faced with the bitter choice of emigration with all its uncertainty or the prospect of drawing a beggar's pension, they chose what they considered to represent security. They did not think of what Spinoza had renounced or of the Göttingen Seven. [....] A simple examination of the lecture program shows that Heidelberg University is no longer the university whose anniversary the Nazis are pretending to celebrate. Whoever believes they can ignore the fact that famous researchers were pushed aside by unknown local Nazis is denying the German university tradition. He is then in fact supporting those who have expelled 1,500 professors from German professorships and approving, perhaps unwittingly, the continuation of this campaign of destruction. [...]

The dismissals from universities and technical institutes that began in early 1933 had been based on the "Law for the Restoration of the Professional Civil Service", enacted on 7 April 1933. The Nuremberg Laws, introduced in autumn 1935, further aggravated the situation. These laws relegated all German Jews to a status of second-class citizens. Dismissals from all kinds of positions continued, and robbery of assets, disguised under the term "Aryanization", accelerated. "Mixed" marriages were forbidden; in existing marriages the "Aryan" partner was pressured to divorce his or her "non-Aryan" spouse. Some "Aryan" professors who refused lost their university positions as a consequence. Several mathematicians were affected by this law.[6] Jewish students were prohibited from studying at universities and from taking

6 See (Pinl; Furtmüller 1973).

exams. Only in a few cases where "Aryan" professors were courageous enough to help their Jewish students were these able to complete their studies.

The German Mathematical Society (DMV)

In early 1933 members and leaders of the DMV – much as in all other scientific associations in Germany – had to decide how they wanted to act or should act in response to the Nazi regime. Should they pay homage to Nazi policy, tolerate and accept criminal actions and laws while offering no resistance? Should they support and help their persecuted colleagues? Only a few mathematicians had the courage to help.

Like in all other areas of life in Germany, the Gleichschaltung now began in the DMV as well, although Ludwig Bieberbach (1886-1982), who was an enthusiastic Nazi, did not succeed in establishing the so-called "Führerprinzip" at the society's annual meeting in September 1934. While he found the assistance of the Göttingen mathematician Erhard Tornier (1894-1982), the majority of the society's members voted against him.[7] Bieberbach resigned from the DMV at the end of 1935 and continued to propagate the ideology of "Deutsche Mathematik", publishing a journal of the same name. In 1937, Gumbel reviewed the first issues of Bieberbach's journal in an article entitled "Aryan Mathematics" in the journal *Das Wort*, which was published in exile.[8] He described the large discrepancies between political articles written by Nazi supporters and professional work where Jewish mathematicians, some of whom had already emigrated, were still cited. He quoted passages that disparaged Jewish mathematicians with humor and fine irony, and he concluded: "The Nazis have managed the Gleichschaltung of German universities. However, it cannot be assumed that Ku- and Bieberbäche will enrich the stream of mathematical knowledge in this way."[9]

Several mathematicians left the DMV when they emigrated, and the society replaced Otto Blumenthal in the editorial board of its journal *Jahresberichte der DMV*.[10] However, a general policy of excluding Jewish members was not yet in place. In early 1936, some Nazi Dozentenführer protested against the DMV because Gumbel,[11] who had been stripped of his citizenship in 1933, was still registered as a member. After the "Reichskristallnacht" in 1938, the DMV board, which at the time consisted of Helmut Hasse, Conrad Müller, Emanuel Sperner and Wilhelm Süss, turned to the "Jewish question" in the DMV. In contrast to the German Physical Society [Deutsche Physikalische Gesellschaft], which had called on its members to decide for themselves whether dismissals were necessary or not,[12] the DMV board voted for a more "thorough" variant: they wanted first to "identify" the members in question and then come to a "solution". The board – led by Wilhelm Süss, president of the DMV between 1937 and 1945, SA member since 1933 and NSDAP member since 1937 – compiled a list of Jewish members. In 1938 there were still some Jews in the DMV: for instance Otto Blumenthal, Max Dehn, Friedrich Hartogs, Alfred Pringsheim and Issai Schur.[13] These members were now sent a letter – like the one addressed to Friedrich Hartogs – in which they were urged to leave the society or their membership would be considered "annulled". This process continued over the next few months until the "Jewish question", as the issue was referred to in internal correspondence, was "solved".

7 On the history of the DMV during the Nazi time, see (Remmert 2004a, 2004b) as well as (Schappacher; Kneser 1990) and (Mehrtens 1985).

8 (Gumbel 1937), [Aryan mathematics]; republished in (Vogt 1991: 218-221).

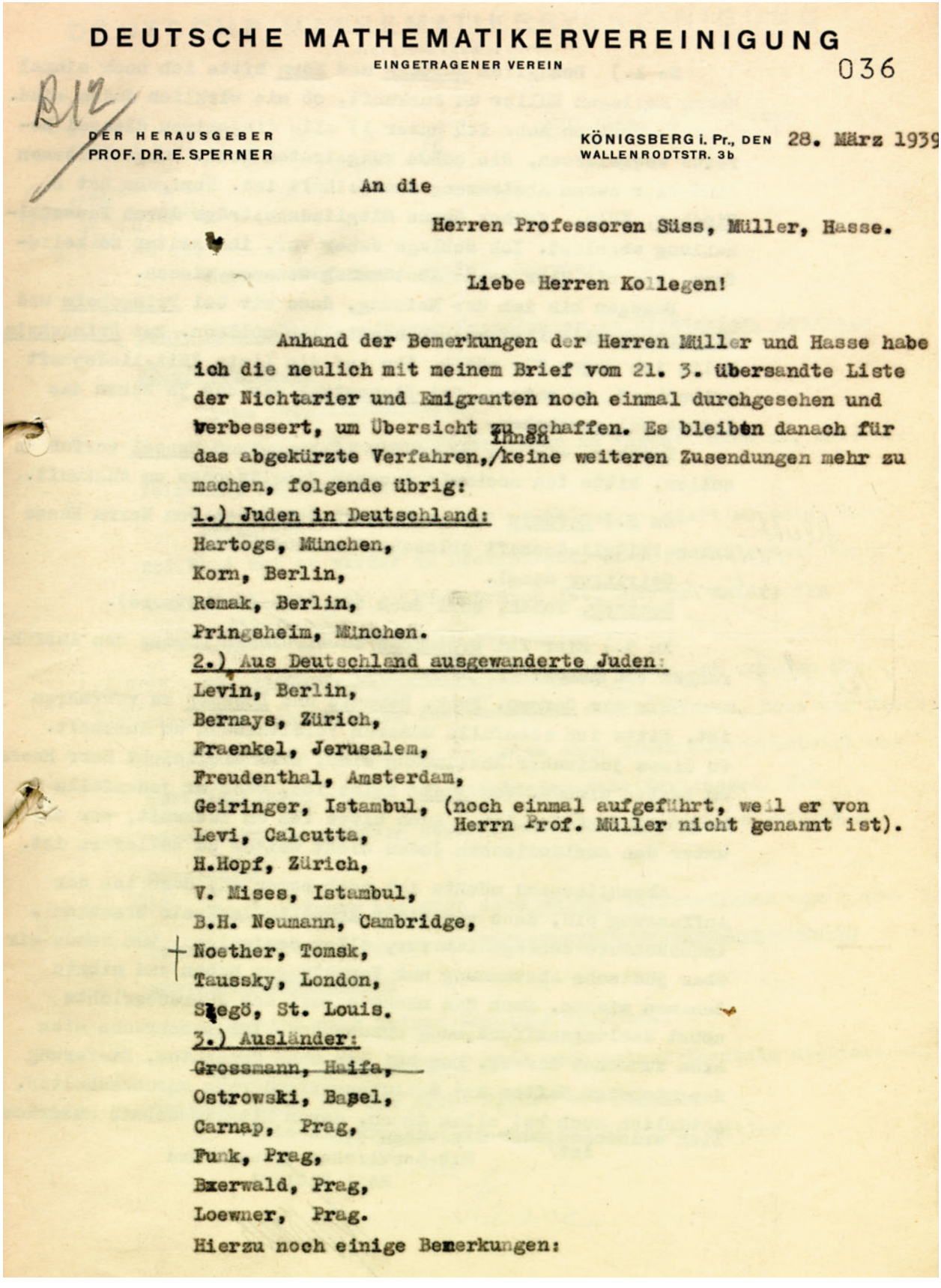
9 (Gumbel 1937: 110), quoted in (Vogt 1991: 221). Gumbel plays with the names of Fritz Kubach (1912-1945), another Nazi activist and supporter of "Deutsche Mathematik" and Ludwig Bieberbach. The ending "-bach" means brook.

10 See (Remmert 2004a: 160).

11 Dozentenführer were either lecturers or professors, members of the Nazi Party, who were able, for example, to support or ban a Habilitation; they very often denounced students and colleagues. See (Remmert 2004a: 165).

12 On the Physical Society in Nazi time see (Hoffmann; Walker 2007).

13 See (Remmert 2004b: 224-228). See E. Sperner's letter to Süss, Müller and Hasse on 28 March1939, with the list of the remaining Jewish mathematicians who were still apparently being sent meeting reports.



DEUTSCHE MATHEMATIKERVEREINIGUNG
EINGETRAGENER VEREIN

036

B12

DER HERAUSGEBER
PROF. DR. E. SPERNER

KÖNIGSBERG i. Pr., DEN 28. März 1939
WALLENRODTSTR. 3b

An die

Herren Professoren Süss, Müller, Hasse.

Liebe Herren Kollegen!

Anhand der Bemerkungen der Herren Müller und Hasse habe ich die neulich mit meinem Brief vom 21. 3. übersandte Liste der Nichtarier und Emigranten noch einmal durchgesehen und verbessert, um Übersicht zu schaffen. Es bleiben danach für das abgekürzte Verfahren, keine weiteren Zusendungen mehr zu machen, folgende übrig:

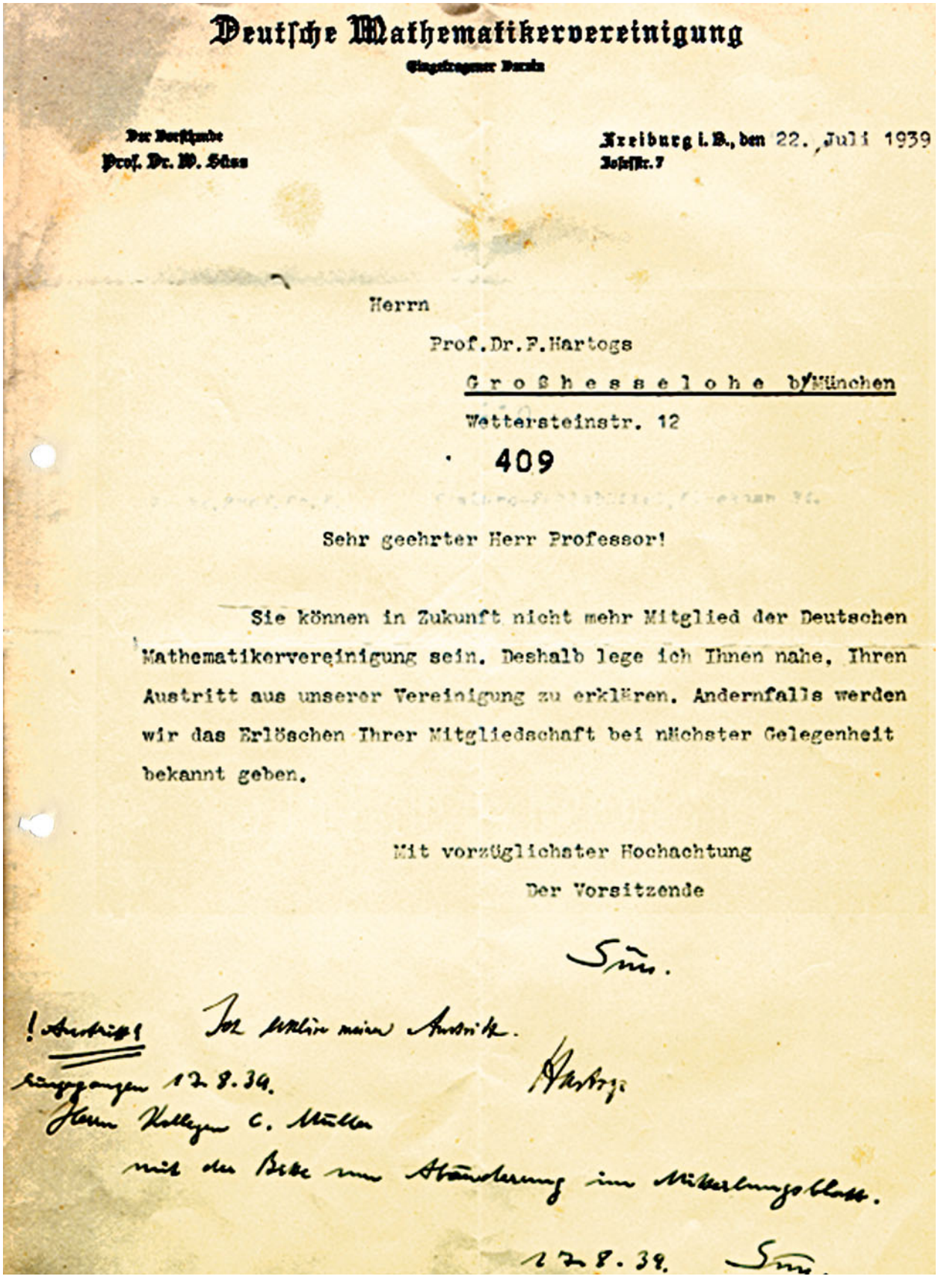
1.) Juden in Deutschland:
Hartogs, München,
Korn, Berlin,
Remak, Berlin,
Pringsheim, München.

2.) Aus Deutschland ausgewanderte Juden:
Levin, Berlin,
Bernays, Zürich,
Fraenkel, Jerusalem,
Freudenthal, Amsterdam,
Geiringer, Istambul, (noch einmal aufgeführt, weil er von Herrn Prof. Müller nicht genannt ist).
Levi, Calcutta,
H.Hopf, Zürich,
V. Mises, Istambul,
B.H. Neumann, Cambridge,
Noether, Tomsk,
Taussky, London,
Szegö, St. Louis.

3.) Ausländer:
~~Grossmann, Haifa,~~
Ostrowski, Basel,
Carnap, Prag,
Funk, Prag,
Bxerwald, Prag,
Loewner, Prag.

Hierzu noch einige Bemerkungen:

List of "Non-Aryans and émigrés" in the DMV, 28 March 1939



Deutsche Mathematikervereinigung

Eingetragener Verein

Der Vorsitzende
Prof. Dr. W. Süss

Freiburg i. B., den 22. Juli 1939
Zeppelinstr. 7

Herrn

Prof. Dr. F. Hartogs

Großhesselohe b/München

Wettersteinstr. 12

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Sehr geehrter Herr Professor!

Sie können in Zukunft nicht mehr Mitglied der Deutschen Mathematikervereinigung sein. Deshalb lege ich Ihnen nahe, Ihren Austritt aus unserer Vereinigung zu erklären. Andernfalls werden wir das Erlöschen Ihrer Mitgliedschaft bei nächster Gelegenheit bekannt geben.

Mit vorzüglichster Hochachtung

Der Vorsitzende

Süss.

! Austritt ! Ich erkläre meinen Austritt.

Hartogs

eingegangen 12.8.39.

Herrn Kollegen C. Müller

mit der Bitte um Stellungnahme im Mitteilungsblatt.

12.8.39. Süss.

Letter from the DMV to Friedrich Hartogs, 22 July 1939

German Mathematical Society
registered association

President
Prof. Dr. W. Süss

Freiburg i. B., 22 July 1939

Prof. Dr. F. Hartogs
Grosshesselohe near Munich
Wettersteinstr. 12
409

Dear Professor,

You can no longer be a member of the German Mathematical Society. I therefore advise you to declare your resignation from our association. Otherwise we shall announce the termination of your membership at the next opportunity.

Our sincerest respect
The President
SÜSS

[Handwritten:]
! Resignation! I hereby declare my resignation.
HARTOGS
Received: 17 August 39
Colleague C. Müller:
Please make the necessary change in the newsletter.

17 August 39 SÜSS

Emigration and exile

The anti-Semitic attacks against Jewish scientists in Nazi Germany had been followed closely from abroad and several help committees were established in order to support the attempts of refugees to build a new professional existence. The most important of these were:

- Notgemeinschaft deutscher Wissenschaftler im Ausland (Emergency Committee of German Scientists Abroad), founded in Zurich in 1933, moved to London in 1935;
- the Rockefeller Foundation with its Paris office;
- the Emergency Committee in Aid of Displaced German Scholars, established in New York in 1933;

- the Academic Assistance Council (AAC) in London, founded in April 1933, renamed the Society for the Protection of Science and Learning (SPSL) in 1937; this is the organization which, in 1936, published the *List of Displaced German Scholars*.[14]

These committees worked hard to organize and coordinate aid services. For example, thanks to a grant from the Paris office of the Rockefeller Foundation, Gumbel was given an appointment at the University of Lyon. Close relations were established between the Notgemeinschaft in Zurich and the AAC in London. The AAC and the Notgemeinschaft decided to be responsible for different countries and regions: the Notgemeinschaft covered Central and South America, Turkey, Persia and Russia (the USSR) while the AAC coordinated efforts for the British Empire, which meant not only Great Britain but also South Africa, the Far East and the British mandated territory of Palestine (with all the limitations British policy brought with it for émigrés to Palestine).

Beginning in 1933, the AAC set up a card system for all those who arrived seeking aid. Each émigré had to fill out a questionnaire stating name, age, area of expertise, religion, reason for dismissal, former income, language skills, preferred country and additional family members. A curriculum vitae and references were also required.[15] This information became the basis of the *List of Displaced German Scholars*. Published by the AAC in 1936, the *List* was compiled by comparing various lists with the names of dismissed scientists and scholars and broken down according to discipline. All in all, it contained 1,624 scholars, 60 of whom were mathematicians. This publication still serves as the basis for any research on exiled scholars today.[16]

Pinl and Furtmüller, who investigated the fate of 127 dismissed mathematicians, found that they had fled to 16 different countries. As became clear only later, going into exile saved these scholars' lives. But it also brought many difficulties and uncertainties – the search for positions, worries about relatives, language difficulties. The simple entry the AAC noted on positions it had arranged – "temporary", "permanent" (which meant a position between one and two years) and "unplaced" – illustrates the difficulties involved. Of the 60 mathematicians, sixteen held "temporary positions", twenty-one "permanent positions", while twenty-three others remained "unplaced".

Many mathematicians had to flee more than once. After leaving Germany, Stefan Bergmann had to flee from the USSR to the USA, Emil Julius Gumbel from France to the USA, Richard von Mises and Hilda Pollaczek-Geiringer from Turkey to the USA, while others had to flee from Norway or Denmark. Ludwig Basnizki (1885-1957),[17] the author of a book on the Jewish calendar which was still published in Nazi Germany in 1938, fled to Brazil via Switzerland. Only a few mathematicians emigrated to Scandinavian countries, five to Palestine/Israel and twenty to Great Britain. More than half of the fleeing mathematicians went to the USA. How many mathematicians had to flee first from Germany and later from the countries occupied by Germany still remains an open question.[18] Recent studies call for renewed discussion and investigation on this topic. Not all persecuted mathematicians could emigrate, or did emigrate far enough. Several died in concentration camps or were killed in other ways. Still others committed suicide. Information on some of those who perished will be found in other places of this volume.

14 See (List 1936) and (Strauss 1987). On the AAC, see (Beveridge 1959) and (Hirschfeld 1988).

15 See box 119/2 to 119/4 on the Notgemeinschaft as well as "personal files" of all émigrés named in the (List 1936), (Oxford, Bodleian Library, Archive S.P.S.L.).

16 See (Strauss; Röder 1980-1983).

17 See (Basnizki 1998).

18 While the AAC compiled a list of 60 mathematicians in 1936, (Pinl; Furtmüller 1973) reconstructed the fate of 127 mathematicians, and the authors of the 1998 exhibition catalogue counted 130 mathematicians, see (Brüning 1998: 61-65).

MATHEMATICS

BAER, Dr. Reinhold, Privatdozent; b. 02., married, 1 child. (English.) 1926/28: Assistant, later Privatdozent Freiburg University; 1928/33: Privatdozent Halle University; 1933/34: Researcher Manchester University; since 1935: Institute for Advanced Study, Princeton (N.J.). SPEC.: *Pure Maths.; Foundation Theory of Sets; Theory of Groups; Fields' Algebraic Theory; Topology; Algebraic Theory of Differential Equations.* Temp.

BAERWALD, Hans Georg, see ENGINEERING. PHYSICS.

BERGMANN, Dr. Stephan, Privatdozent; b. 97., single. 1922/23: Assistant Institut für Angewandte Mathematik, Berlin University; 1924/31: Researcher and Industrial Activity, Lodz; 1932/33: Privatdozent Berlin University; since 1934: State University, Tomsk. SPEC.: *Pure and Applied Maths.; Theory of Elasticity; Conformal Representation; Differential Equations; Hydrodynamics; Theory of Functions.* Perm.

BERNAYS, Dr. Paul, a.o. Professor; b. 88., single. (English, French.) 1917/33: Privatdozent, later a.o. Prof. Göttingen University and Assistant Mathematisch-Physikalisches Seminar; 1934/35: Lecturer Technische Hochschule, Zürich; 1935/36: Visiting Lecturer Institute for Advanced Study, Princeton (N.J.); 1936/37: Eidgenössisches Polytechnikum, Zürich. SPEC.: *Logic; Foundation of Mathematics.* Temp.

BERNSTEIN, Dr. Felix, o. Professor; b. 78., married, 2 children. (English.) 1904/08: Privatdozent Halle University; 1908/33: Privatdozent, later o. Prof. Göttingen University; since 1934: Columbia University, New York. SPEC.: *Statistics; Group Theory; Calculation of Probability; Insurance; Finance.* Temp.

BLUMENTHAL, Dr. Otto, o. Professor; b. 76., married, 2 children. (English, French, Italian, Russian, Dutch, Bulgarian.) 1901/04: Privatdozent Göttingen University; 1905/33: o. Prof. Technische Hochschule, Aachen; since 1906: Editor "Mathematische Annalen." SPEC.: *Pure and Applied Maths.; Theory of Functions; Hydrodynamics.* Unpl.

BOCHNER, Dr. Salomon, Dozent; b. 99. Till 1933: Dozent Munich University; since 1933: Princeton University. Perm.

BRAUER, Dr. Richard, Privatdozent; b. 01., married, 2 children. (English, French.) 1925/33: Assistant, later Privatdozent Königsberg University; 1934/35: Assistant Institute for Advanced Study, Princeton (N.J.); since 1936: Assistant Prof. Toronto University. SPEC.: *Pure Maths.; Algebra; Group Theory; Theory of Hypercomplex Numbers.* Perm.

BREUER, Dr. Samson, a.o. Professor; b. 91., married, 6 children. (English, French, Hebrew.) 1921/33: Privatdozent, later a.o. Prof. Technische Hochschule, Karlsruhe; 1928/33: Dozent Frankfurt University; since 1934: Industrial Activity, Jerusalem. SPEC.: *Pure and Applied Maths.; Algebra; Insurance; Statistics.* Perm.

COURANT, Dr. Richard, o. Professor; b. 88., married, 4 children. (English.) 1912/33: Privatdozent, later o. Prof. Göttingen University; 1933/34: Lecturer Cambridge University; since 1935: New York University. SPEC.: *Pure Maths.* Perm.

DEHN, Dr. Max, o. Professor; b. 78., married, 1 child. (English, French, Norwegian.) 1911/13: a.o. Prof. Kiel University; 1913/21: o. Prof. Technische Hochschule, Breslau; 1921/35: o. Prof. Frankfurt University. SPEC.: *Pure Maths.; Analysis; Algebra; History of Mathematics.* Unpl.

DINGLER, Dr. Hugo, see PHILOSOPHY.

FELLER, Dr. Willy, Privatdozent; b. 06., single. (English, French, Croatian.) 1926/28: Assistant Göttingen University; 1928/33: Privatdozent Kiel University; since 1934: Institute of Mathematics, Stockholm University. SPEC.: *Pure and Applied Maths.; Differential Geometry; Modern Theory of Real Functions.* Temp.

FENCHEL, Dr. Werner, Assistant; b. 05., married. (English, Italian, Danish.) Till 1933: Assistant Göttingen University; since 1934: Matematisk Institut, Copenhagen. SPEC.: *Pure and Applied Maths.; Geometry; Analysis; Mathematical Methods of Economics.* Temp.

FRAENKEL, Dr. Adolf, o. Professor; b. 91., married, 4 children. 1916/28: Privatdozent, later a.o. Prof. Marburg University; 1928/33: o. Prof. Kiel University; since 1933: Prof. Hebrew University, Jerusalem. SPEC.: *Pure Maths.; Theory of Sets; Arithmetic; Borderline of Philosophy.* Perm.

GOLOMB, Dr. Michael, Researcher; b. 09., single. (English, French, Italian, Spanish.) 1933: Researcher Berlin University; since 1934: Zagreb. SPEC.: *Pure Maths.; Analysis of Functions; Differential and Integral Equations.* Unpl.

GRADSTEIN, Dr. Stephan, see PHYSICS, ENGINEERING.

GUMBEL, Dr. Emil J., a.o. Professor; b. 91., married, 1 child. (English, French, Italian.) 1923/33: Privatdozent, later a.o. Prof. Heidelberg University; since 1933: Lyons University. SPEC.: *Applied Maths.; Statistics; Calculus of Probability; Actuarial Science.* Perm.

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The list of displaced mathematicians in the *List of Displaced German Scholars*, compiled by the Academic Assistance Council, London 1936.

Mathematics

HAMBURGER, Dr. Hans L., o. Professor; b. 89. 1919/24: Privatdozent, later a.o. Prof. Berlin University; 1924/33: o. Prof. Cologne University. SPEC.: *Theory of Functions; Differential Geometry.* Unpl.

HEILBRONN, Dr. Hanns, Assistant; b. 08., single. (English.) 1930/33: Assistant Göttingen University; 1933/35: Researcher Bristol University; since 1936: Researcher: Trinity College, Cambridge University. SPEC.: *Pure Maths.; Theory of Numbers; Functions; Analysis.* Perm.

HELMER-HIRSCHBERG, Dr. Olaf, Researcher; b. 10., single. (English, French.) 1934: Researcher Berlin University; 1935/36: Researcher Bedford College, London University. SPEC.: *Pure Maths.; Algebra; Theory of Functions; Logic.* Unpl.

HERZBERGER, Dr. Max, Privatdozent; b. 99., married, 3 children. (English, French, Italian, Spanish, Dutch.) Till 1933: Privatdozent Jena University and Zeiss, Jena; since 1934: Eastman Kodak Co., Rochester (N.Y.). SPEC.: *Geometrical Optics.* Perm.

HIRSCH, Dr. Kurt A., Researcher; b. 06., married, 2 children. (English, French). Till 1933: Researcher Berlin University; since 1934: Researcher, Cambridge University. SPEC.: *Pure Maths.; Algebra; Theory of Groups.* Temp.

HOHENEMSER, Dr. Kurt Heinrich, see ENGINEERING.

HOPF, Dr. Ludwig, o. Professor; b. 84., married, 5 children. (English, French.) 1911/23: Assistant Aerodynamisches Institut, Technische Hochschule, Aachen; 1914/34: Privatdozent, later o. Prof. Technische Hochschule, Aachen. SPEC.: *Applied Maths.; Hydrodynamics; Aerodynamics; Mechanics; Differential Equations; Modern Theoretical Physics.* Unpl.

JACOBSTHAL, Dr. Ernst, a.o. Professor; b. 82., married. Till 1933: a.o. Prof. Technische Hochschule, Berlin. Unpl.

JENTZSCH, Dr. Felix, o. Professor; b. 82. 1912/20: Privatdozent, later a.o. Prof. Giessen University; 1920/35: a.o. Prof. later o. Prof. Jena University. SPEC.: *Applied Maths.; Optics.* Unpl.

JOHN, Dr. Fritz, Assistant; b. 10., married. (English, French, Italian, Dutch, Russian.) 1930/33: Assistant Mathematisches Institut, Göttingen University; 1934/35: Researcher St. John's College, Cambridge University; since 1935: Assistant Prof. Kentucky University, Lexington. SPEC.: *Analysis; Geometry.* Temp.

JORDAN, Dr. Henry A., Researcher; b.02., single. (English, French, Italian, Dutch.) 1928/29: Researcher Edinburgh University; 1930: Assistant Observatorium,. Bamberg; 1930/34: League of Nations Institute (Educational Cinematography), Rome; since 1935: Georgetown University, Washington, D.C. SPEC.: *Pure and Applied Maths.; Analysis; Bessel and Automorphic Functions; Educational Cinematography.* Temp.

KAUFMANN, Dr. Boris, Researcher; b. 04., single. (English, French, Russian.) 1930/33: Researcher Heidelberg University; since 1933: Researcher Cambridge University. SPEC.: *Pure Maths.; Geometry; Topology; Theory of Functions.* Temp.

LANDAU, Dr. Edmund G. H., o. Professor; b. 77. 1901/09: Privatdozent Berlin University; 1909/33: o. Prof. Göttingen University and Director Mathematisches Institut. SPEC.: *Theory of Numbers and Theory of Functions.* Unpl.

LEDERMANN, Walter, Researcher; b. 11., single. (English, French.) Till 1933: Researcher Berlin University; 1934/35: Researcher St. Andrews University. SPEC.: *Pure and Applied Maths.; Higher Algebra; Matrix Theory.* Unpl.

LESSHEIM, Dr. Hans, see PHYSICS.

LEVI, Dr. Friedrich, W. D., a.o. Professor; b. 88., married, 3 children. (English, French, Italian.) 1919/33: Privatdozent, later a.o. Prof. Leipzig University; since 1934: Calcutta University. SPEC.: *Pure Maths.; Group Theory; Topology; Geometry; Theory of Configuration.* Perm.

LEVIN, Dr. Victor, Assistant; b. 09., single. (English.) 1930/33: Assistant Technische Hochschule, Berlin; since 1933: India. SPEC.: *Applied Maths.; Pure Maths.; Mechanics.* Temp.

LEWY, Dr. Hans, Privatdozent; b. 04., single. (English, French, Hebrew.) 1927/33: Privatdozent Göttingen University; 1933/35: Researcher Brown University, Providence, R.I.; since 1936: California University, Berkeley. SPEC.: *Differential Equations, esp. Partial.* Perm.

LIEBMANN, Dr. Heinrich, o. Professor; b. 74. 1909: Privatdozent Leipzig University; 1910/20: a.o. Prof. Technische Hochschule, Munich; 1920/35: o. Prof. Heidelberg University. SPEC.: *Pure Maths.; Differential Equations; Geometry.* Unpl.

LOEWY, Dr. Alfred, o. Professor; b. 73., married. 1897/1933: Privatdozent, later o. Prof. Freiburg University. Unpl.

Mathematics

LÜNEBURG, Dr. Rudolf, Assistant; b. 03., single. (English, French, Dutch.) 1931/33: Assistant Mathematisches Institut, Göttingen University; since 1934: Utrecht University. SPEC.: *Pure Maths.; Calculation of Probability; Differential Equations.* Temp.

MAHLER, Dr. Kurt, Assistant; b. 03., single. (English, French, Italian, Russian, Dutch.) 1927/28: Assistant Göttingen University; 1928/33: Researcher Göttingen and Frankfurt Universities; 1933/34: Honorary Research Fellow Manchester University; 1934/36: Researcher and Lecturer Groningen University. SPEC.: *Pure and Applied Maths.; Theory of Numbers; Theory of Functions; Diophantine Approximations.* Unpl.

MISES, Richard Edler von, o. Professor; b. 83., single. (English, French, Turkish.) 1919/20: o. Prof. Frankfurt University; 1920/33: o. Prof. Berlin University and Director Institut für Angewandte Mathematik; since 1934: o. Prof. Istanbul University and Director Institute of Mathematics. SPEC.: *Pure and Applied Maths.; Theory of Probability; Aeronautics.* Perm.

MOHRMANN, Dr. Hans, o. Professor; b. 81., single. (English, French, Italian.) 1919/27: o. Prof. Basle University; 1927/31: o. Prof. Technische Hochschule, Darmstadt; 1931/34: o. Prof. Giessen University. SPEC.: *Geometry.* Unpl.

NEMENYI, Dr. Paul, see ENGINEERING.

NEUGEBAUER, Dr. Otto, a.o. Professor; b. 99. Till 1933: Privatdozent, later a.o. Prof. Göttingen University; since 1934: Copenhagen University. SPEC.: *History of Mathematics.* Perm.

NEUMANN, Dr. Bernhard Herrmann, Researcher; b. 09., single. (English, French.) 1931/33: Researcher Berlin University; 1933/35: Researcher Cambridge University. SPEC.: *Pure Maths.; Abstract Algebra; Group Theory, esp. Discontinuous Groups.* Unpl.

NOETHER, Dr. Fritz, o. Professor; b. 84., 1912/22: Privatdozent, later a.o. Prof. Technische Hochschule, Karlsruhe; 1922/33: o. Prof. Breslau University and Technische Hochschule; since 1934: State University, Tomsk. SPEC.: *Applied Maths.; Mechanics; Theoretical Physics.* Perm.

PIRANI, Dr. Marcello, see PHYSICS.

POLLACZEK-GEIRINGER, Dr. Hilda, Privatdozent; b. 95., married, 1 child. (English, French.) 1921/33: Assistant Institut für Angewandte Mathematik, Berlin University; 1927/33: Privatdozent Berlin University; 1933/34: Prof. Brussels University; since 1934: Dozent Istanbul University. SPEC.: *Applied Maths.; Theory of Probability; Theoretical Mechanics; Practical Analysis; Statics; Geometry.* Temp.

PRAGER, Dr. Willy, o. Professor; b. 03., married, 1 child. (English, French, Turkish.) Till 1933: Privatdozent Göttingen University; 1933: o. Prof. Technische Hochschule, Karlsruhe; since 1934: o. Prof. Istanbul University. SPEC.: *Applied Maths.; Mechanics; Oscillation and Plasticity; Statics.* Perm.

RADEMACHER, Dr. Hans A., o. Professor; b. 92., married, 2 children. (English, French.) 1919/22: Privatdozent Berlin University; 1922/25: a.o. Prof. Hamburg University; 1925/34: o. Prof. Breslau University; since 1935: Prof. Pennsylvania University, Philadelphia. SPEC.: *Pure Maths.; Theory of Numbers, esp. Algebraic; Theory of Functions; Mathematical Genetics.* Perm.

RADO, Dr. Richard, Researcher; b. 06., married. (English, French.) 1931/33: Researcher Berlin University; 1933/36: Researcher Cambridge University; since 1936: Assistant Lecturer Sheffield University. SPEC.: *Pure Maths.; Theory of Numbers; Analysis; Algebra; Combinations.* Temp.

REMAK, Dr. Robert, Privatdozent; b. 88., married. (English, French.) 1929/33: Privatdozent Berlin University. SPEC.: *Pure Maths. Group Theory; Geometry of Numbers.* Unpl.

ROGOSINSKI, Dr. Werner, a.o. Professor; b. 94., married, 1 child. (English, French.) 1923/36: Privatdozent, later a.o. Prof. Königsberg University. SPEC.: *Pure Maths.; Analysis; Theory of Functions; Fourier Series.* Unpl.

ROSENTHAL, Dr. Arthur, o. Professor; b. 87., single. (English, French.) 1912/30: Privatdozent, later a.o. Prof. Munich University; 1930/35: o. Prof. Heidelberg University. SPEC.: *Pure and Applied Maths.; Theory of Real and Complex Functions; Set Theory; Geometry.* Unpl.

ROTHE, Dr. Erich, Privatdozent; b. 95., married, 1 child. (English, French.) 1927/34: Assistant Technische Hochschule, Breslau; 1928/34: Privatdozent Breslau University. SPEC.: *Pure Maths. Analysis, esp. Differential and Integral Equations; Mathematical Physics.* Unpl.

SADOWSKY, Dr. Michael A., Privatdozent; b. 02., married. (English, French, Russian.) 1927/31: Assistant, later Privatdozent Technische Hochschule, Berlin; 1931/34: Assistant Prof. Minnesota University, Minneapolis; since 1935: U.S.S.R. SPEC.: *Applied Maths.; Mechanics; Elasticity; Strength of Materials; Approximate Methods.* Perm.

SCHUR, Dr. Issai, o. Professor; b. 75. 1903/35: Privatdozent, later o. Prof. Berlin University. SPEC.: *Pure Maths.; Algebra.* Unpl.

SCHWERDTFEGER, Dr. Hans, Assistant; b. 02., married, 1 child. (English, French, Russian.) 1930/33: Assistant Göttingen University; since 1934: Prague. SPEC.: *Pure and Applied Maths.; Algebra; Group Theory; Topology.* Unpl.

STEINHAUS, Dr. Heinz, Assistant. Till 1933: Assistant Göttingen University; since 1933: New School for Social Research, New York. SPEC.: *Statistics.* Perm.

STERNBERG, Dr. Wolfgang, a.o. Professor; b. 87., single. (English, French.) 1920/27: Privatdozent Heidelberg University; 1927/33: Privatdozent, later a.o. Prof. Breslau University; since 1936: Jerusalem. SPEC.: *Pure Maths.; Applied Maths; Differential and Integral Equations; Potential Theory; Calculation of Probability; Statistics.* Unpl.

SZASZ, Dr. Otto, a.o. Professor; b. 84., married, 1 child. (English, French, Hungarian.) 1914/33: Privatdozent, later a.o. Prof. Frankfurt University; 1934/36: Visiting Prof. Massachusetts Institute of Technology, Cambridge; since 1936: Visiting Lecturer, Cincinnati University. SPEC.: *Pure Maths.; Continued Fraction; Determinants; Fourier Series; Power Series; Approximation.* Temp.

SZEGÖ, Dr. Gabriel, o. Professor; b. 95. (English.) 1921/26: Privatdozent, later a.o. Prof. Berlin University; 1926/33: o. Prof. Königsberg University; since 1935: Visiting Prof. George Washington University, St. Louis, Missouri. Perm.

TULN, Dr. Peter, Assistant; b. 06., married, 1 child. (English, French, Spanish.) 1930/33: Assistant Münster University; 1933/34: Researcher Rome University; since 1935: Prof. Quito Polytechnic, Ecuador. Perm.

WARSCHAWSKI, Dr. Stefan, Assistant; b. 04. 1927/30: Assistant Basle University; 1930/33: Assistant Göttingen University; since 1934: Columbia University, New York. SPEC.: *Pure Maths.; Conformal Representation.* Temp.

WEINSTEIN, Dr. Alexander, Privatdozent; b. 97., married. (English, French, Italian.) 1924: Assistant Lecturer University College, Swansea; 1928: Privatdozent Hamburg University; 1928/33: Privatdozent Breslau University; since 1934: Researcher Imperial College of Science and Technology, London University. SPEC.: *Pure and Applied Maths.; Harmonic Functions; Conformal Representation; Hydrodynamics; Group Theory.* Temp.

WEYL, Dr. Hermann, o. Professor; b. 85., married. (English.) 1910/13: Privatdozent Göttingen University; 1913/30: o. Prof. Technische Hochschule, Zürich; 1930/33: o. Prof. Göttingen University; since 1933: Institute for Advanced Study, Princeton (N.J.) SPEC.: *Pure and Applied Maths.; Theoretical Physics; Philosophy.* Perm.

ZERNER, Dr. Friedrich, Assistant; b. 95., married, 1 child. 1918/1920: Assistant Vienna University; 1920/1921: Assistant Technische Hochschule, Berlin; since 1922: Researcher Vienna. SPEC.: *Applied Maths.; Theory of the Formation of Gas and Clouds; Electron Theory; Theory of Relativity.* Unpl.

MEDICINE

Anatomy - Embryology - Histology

BRANDT, Dr. Walter, o. Professor; b. 89., married, 2 children. (English, French, Italian.) 1923/26: Privatdozent Freiburg University; 1926/35: o. Prof. Cologne University and Director Anthropologisches Institut. SPEC.: *Anthropology; Biology; Experimental Embryology; Endocrinology.* Unpl.

GLÜCKSMANN, Dr. Alfred, Assistant; b. 04., single. (English, French.) 1929/33: Assistant Anatomisches Institut, Heidelberg University; since 1933: Strangeways Research Institute, Cambridge University. SPEC.: *Anatomy; Embryology; Histology; Bone Pathology; Cancer Research.* Perm.

JACOBSON, Dr. Werner, Assistant; b. 06., married. (English, French.) 1930/33: Assistant Anatomisches Institut, Bonn University; since 1933: Strangeways Research Institute, Cambridge University. SPEC.: *Anatomy; Histology; Embryology; Differentiation of Tissues.* Perm.

LÖWENTHAL, Dr. Karl, Director; b. 92., married, 2 children. (English, French, Turkish.) 1927/33: Director Krankenhäuser Lankwitz und Lichtenberg, Berlin; 1933: Researcher Cancer Institute, Villejuive, Paris; since 1933: a.o. Prof. Istanbul University. SPEC.: *Embryology; Histology. Tumours; Arteriosclerosis; Lipoids; Endocrinology.* Perm.

Emigration: success, obstacles, failures

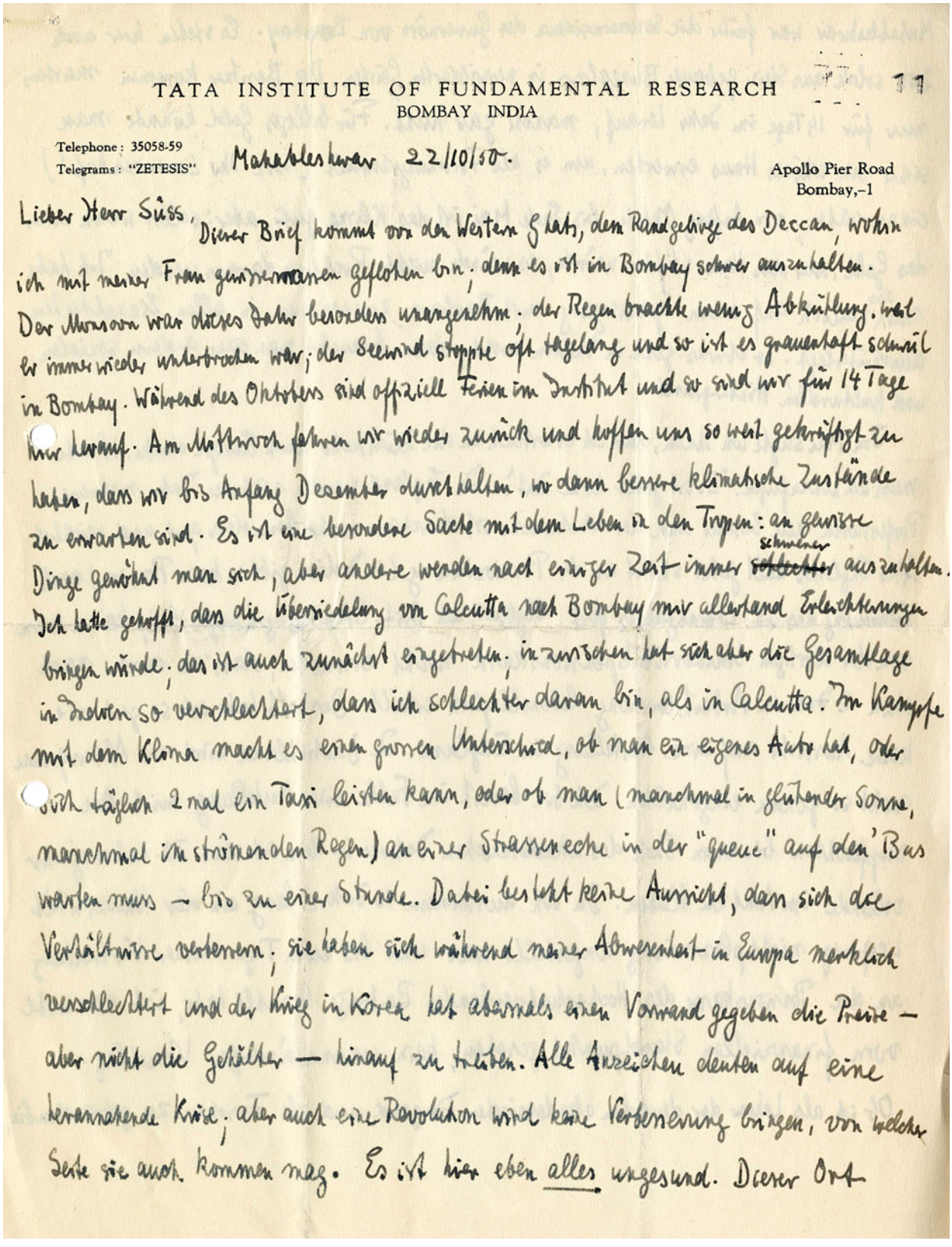
The reality of emigration was quite different in the individual cases. The age, discipline, previous status in the home country and career opportunities in the country of exile, good friends and references from well-known scientists, all of these factors could prove to be either barriers or benefits in the escape into the unknown. Three examples may illustrate the differences.

Richard Courant was dismissed from the University of Göttingen in 1933 because of the "Law for the Restoration of the Professional Civil Service" and decided to leave the country that same year. In New York, he was given the task of organizing the mathematical department of the New York University Graduate School of Arts and Science. In 1937 Kurt O. Friedrichs, his former assistant at the University of Göttingen who had left Germany because he was married to a Jewish woman, joined him there, and the department increasingly became a place of important mathematical research. In 1946 it was renamed Institute for Mathematics and Mechanics, becoming one of the world's leading centers for applied mathematics and mathematical analysis. In 1964 it was once again renamed Courant Institute for Mathematical Sciences. Together with another émigré, Hermann Weyl, and the American mathematician Oswald Veblen, Courant became one of the main organizers of the help for persecuted German mathematicians who wanted to emigrate to the USA.

Richard Courant standing in front of the Courant Institute in New York

Kurt O. Friedrichs receiving the National Medal of Science from US President Jimmy Carter in 1977

Friedrich Wilhelm Levi (1888-1966) was dismissed from the University of Leipzig in summer 1935. He tried to emigrate, and finally in November 1935 he was appointed at the University of Calcutta. In January 1936 he received a five-year contract as Hardinge Professor of Higher Mathematics. The mathematicians Harald Bohr (Copenhagen), G. H. Hardy (Cambridge, UK) und André Weil (Strasbourg) wrote letters of recommendation and supported him. Originally the University of Calcutta had wanted to give this professorship to the mathematician Richard Courant, who did not accept it and suggested his colleague Max Dehn, but Dehn did not get the job. Levi worked at the University of Calcutta until he reached retirement age in 1948. He preferred staying in India to returning to Germany, and took a position at the Tata Institute for Fundamental Research in Bombay (today Mumbai) with a two-year contract. In 1950 the contract was renewed for another three years. As Levi's letters from India show, he was never happy with the conditions he found in Calcutta and Bombay.



TATA INSTITUTE OF FUNDAMENTAL RESEARCH
BOMBAY INDIA

Telephone : 35058-59
Telegrams : "ZETESIS"

Mahableshwar 22/10/50.

Apollo Pier Road
Bombay,-1

Lieber Herr Süss, Dieser Brief kommt von den Western Ghats, dem Randgebirge des Deccan, wohin ich mit meiner Frau gewissermassen geflohen bin; denn es ist in Bombay schwer auszuhalten. Der Monsoon war dieses Jahr besonders unangenehm; der Regen brachte wenig Abkühlung, weil er immer wieder unterbrochen war; der Seewind stoppte oft tagelang und so ist es grauenhaft schwül in Bombay. Während des Oktobers sind offiziell Ferien im Institut und so sind wir für 14 Tage hier herauf. Am Mittwoch fahren wir wieder zurück und hoffen uns so weit gekräftigt zu haben, dass wir bis Anfang Dezember durchhalten, wo dann bessere klimatische Zustände zu erwarten sind. Es ist eine besondere Sache mit dem Leben in den Tropen: an gewisse Dinge gewöhnt man sich, aber andere werden nach einiger Zeit immer ~~schlechter~~ schwerer auszuhalten. Ich hatte gehofft, dass die Übersiedelung von Calcutta nach Bombay mir allerhand Erleichterungen bringen würde; das ist auch zunächst eingetreten; inzwischen hat sich aber die Gesamtlage in Indien so verschlechtert, dass ich schlechter daran bin, als in Calcutta. Im Kampfe mit dem Klima macht es einen grossen Unterschied, ob man ein eigenes Auto hat, oder sich täglich 2 mal ein Taxi leisten kann, oder ob man (manchmal in glühender Sonne, manchmal im strömenden Regen) an einer Strassenecke in der "queue" auf den Bus warten muss – bis zu einer Stunde. Dabei besteht keine Aussicht, dass sich die Verhältnisse verbessern; sie haben sich während meiner Abwesenheit in Europa merklich verschlechtert und der Krieg in Korea hat abermals einen Vorwand gegeben die Preise – aber nicht die Gehälter – hinauf zu treiben. Alle Anzeichen deuten auf eine herannahende Krise; aber auch eine Revolution wird keine Verbesserung bringen, von welcher Seite sie auch kommen mag. Es ist hier eben alles ungesund. Dieser Ort

Letter from Friedrich Wilhelm Levi to Wilhelm Süss, 22 October 1950

TATA INSTITUTE OF FUNDAMENTAL RESEARCH
Bombay India

Telephone 35058-59
Telegrams: "ZETESIS"

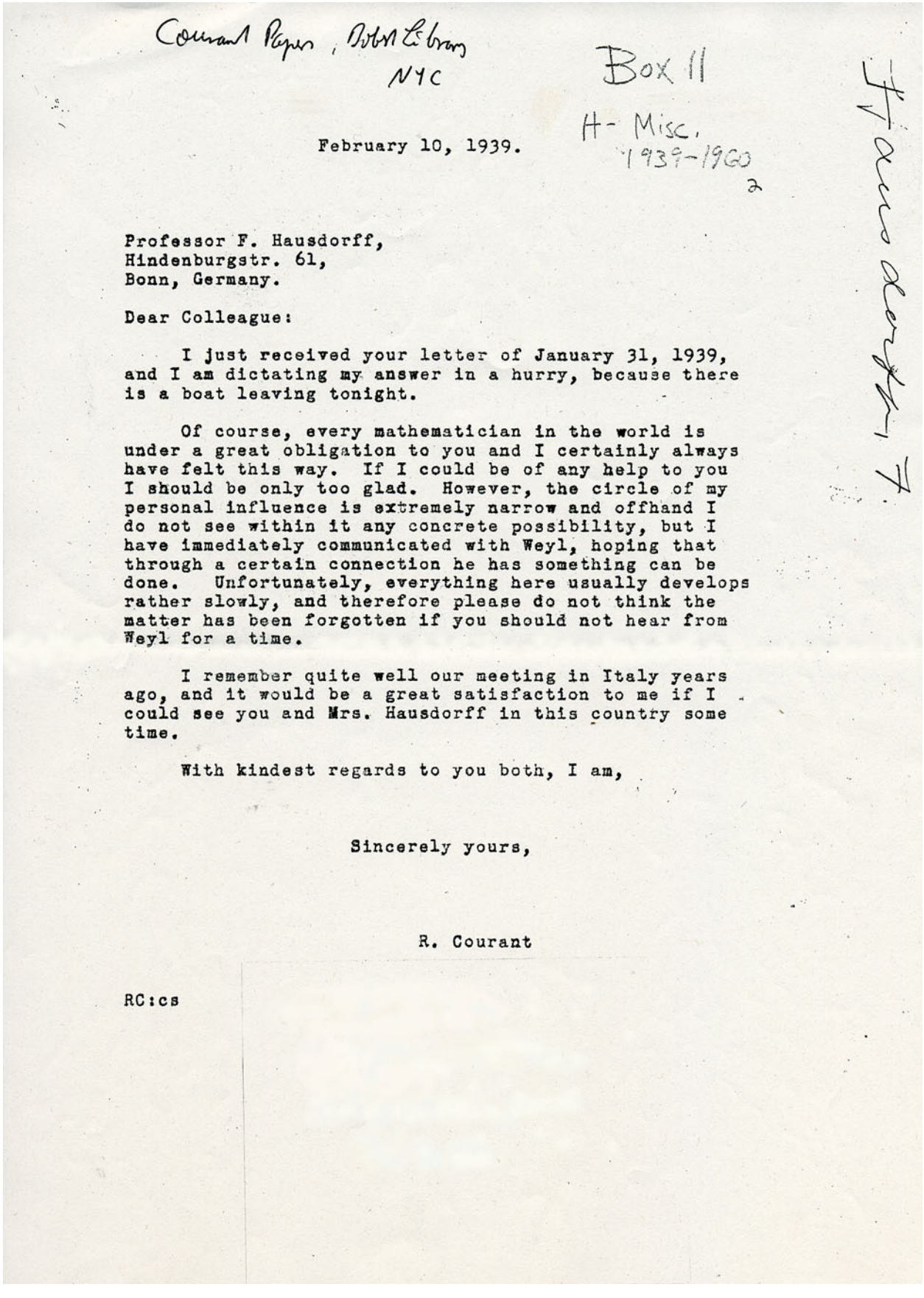
Mahableshwar 22 October 50

Apollo Pier Road
Bombay, -1

Dear Mr. Süss,
This letter comes to you from the Western Ghats, the foothills of the Deccan, where my wife and I have virtually fled to, as things are very hard to bear in Bombay. This year's monsoon was particularly unpleasant; the rains brought very little cooling air, as they were interrupted again and again; the sea winds ceased to blow for several days on end and it is therefore horribly muggy in Bombay. The institute is officially closed during the month of October, so that we took the opportunity to come here for two weeks. We return on Wednesday, and we hope to be restored enough to last until early December, when better climatic conditions are expected. It is a peculiar thing with this life in the tropics: some things one becomes accustomed to while others seem to become even harder to bear with time. I had hoped that our move from Calcutta to Bombay would make things much easier for me, but meanwhile the overall situation in India has become so bad that we are worse off now than we were in Calcutta. In the battle against climatic hardship, it makes a great difference whether one has a car of one's own or can afford to take a cab twice a day, or whether one has to stand in line for a bus (under a torrid sun, or drenched by rain) for up to an hour. And there's no improvement of the conditions in sight; they visibly deteriorated during my stay in Europe, and the war in Korea has provided another excuse to raise prices – but not salaries. All signs are set for a coming crisis, but even a revolution will not make things any better, no matter which side it may come from. Everything here is unhealthy. [...]

Felix Hausdorff

Felix Hausdorff was not successful when, following the pogroms of 1938, he attempted to find a research fellowship in the USA. Courant, Weyl, John von Neumann and others supported him by writing to various institutions, unfortunately without a positive result. Although Hausdorff was one of the most renowned mathematicians in Germany, because he was 74 years old, no university in the USA was willing to offer him a position or fellowship. Hausdorff thus remained in Nazi Germany, losing all hope of leaving the country.



Courant Papers, Bobst Library NYC

Box 11

H- Misc. 1939-1960 2

Hausdorff, F.

February 10, 1939.

Professor F. Hausdorff,
Hindenburgstr. 61,
Bonn, Germany.

Dear Colleague:

I just received your letter of January 31, 1939, and I am dictating my answer in a hurry, because there is a boat leaving tonight.

Of course, every mathematician in the world is under a great obligation to you and I certainly always have felt this way. If I could be of any help to you I should be only too glad. However, the circle of my personal influence is extremely narrow and offhand I do not see within it any concrete possibility, but I have immediately communicated with Weyl, hoping that through a certain connection he has something can be done. Unfortunately, everything here usually develops rather slowly, and therefore please do not think the matter has been forgotten if you should not hear from Weyl for a time.

I remember quite well our meeting in Italy years ago, and it would be a great satisfaction to me if I could see you and Mrs. Hausdorff in this country some time.

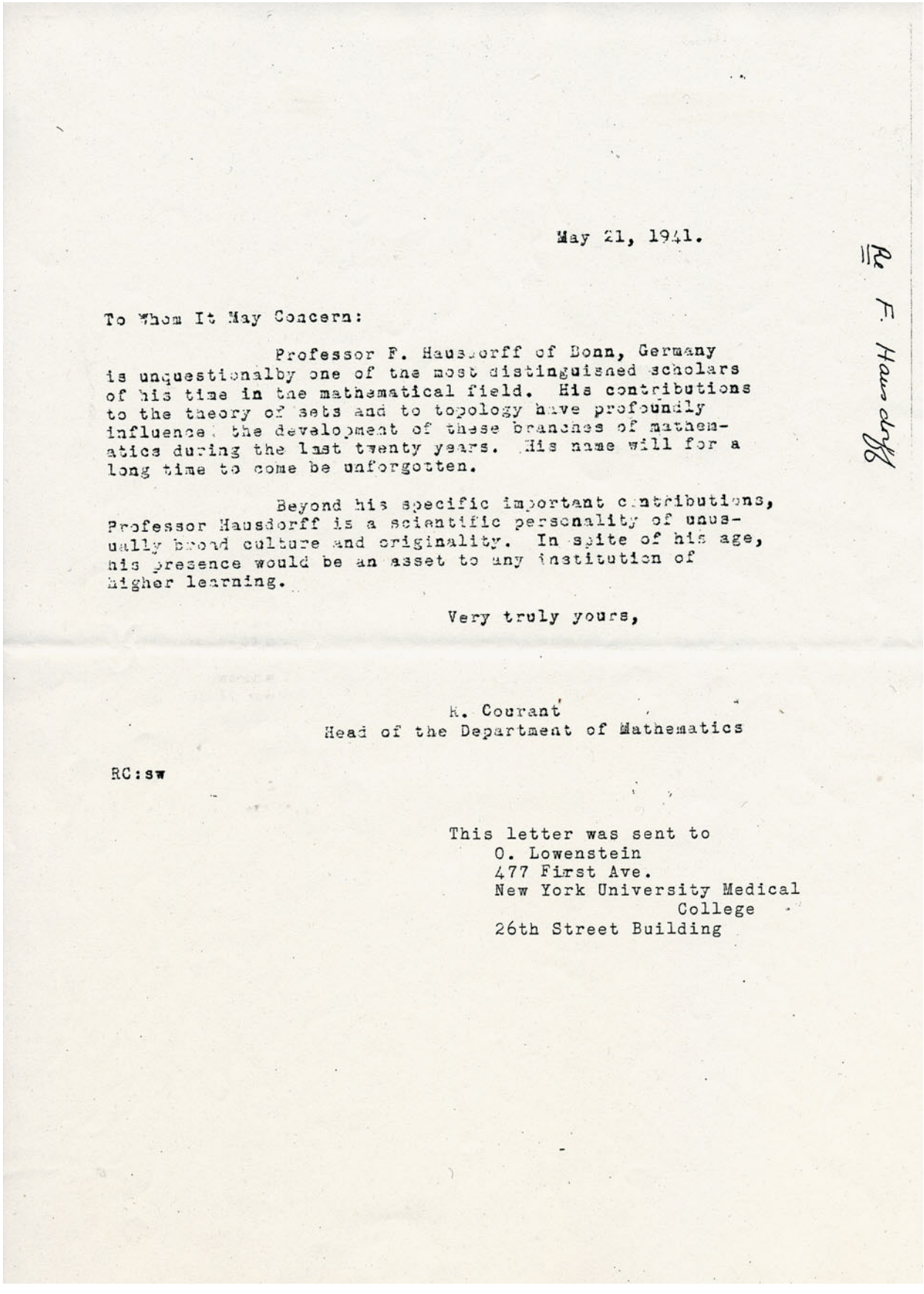
With kindest regards to you both, I am,

Sincerely yours,

R. Courant

RC:cs

Letter from Richard Courant to Felix Hausdorff, 10 February 1939



May 21, 1941.

Re F. Hausdorff

To Whom It May Concern:

Professor F. Hausdorff of Bonn, Germany is unquestionalby one of the most distinguished scholars of his time in the mathematical field. His contributions to the theory of sets and to topology have profoundly influenced the development of these branches of mathematics during the last twenty years. His name will for a long time to come be unforgotten.

Beyond his specific important contributions, Professor Hausdorff is a scientific personality of unusually broad culture and originality. In spite of his age, his presence would be an asset to any institution of higher learning.

Very truly yours,

R. Courant
Head of the Department of Mathematics

RC:sw

This letter was sent to
O. Lowenstein
477 First Ave.
New York University Medical College
26th Street Building

Richard Courant's reference letter for Felix Hausdorff, 21 May 1941

***

More than 65 years after the end of the Nazi regime, additional questions can and should be raised, also with regard to the history of the DMV. One example should be given here. In 1996, the Augsburg mathematician Friedrich Pukelsheim asked in a letter to the editor of the journal *Mitteilungen der DMV* whether there had been further "reassuring episodes" like that of the Berlin pharmacologist Otto Krayer (1899-1982).[19] In 1933, Krayer rejected a professorship in Frankfurt because the previous holder of the position had been dismissed under the "Law for the Restoration of the Professional Civil Service". In his letter to the Ministry of Culture, Krayer openly explained that he had no other choice, in view of the injustice committed. Krayer was therefore unable to pursue a career in Nazi Germany. However, he received a grant from the Rockefeller Foundation and later made a successful career at Harvard University.

One question which remains open is whether there were other scientists who rejected positions at German universities because the previous holders had been dismissed. Where, in what disciplines, at what universities, were there other scientists who did not wish to benefit from the injustices committed, who declined a promotion at this price? Mathematicians and students of mathematics should raise such questions now, and not shirk away from similar issues regarding the history of Jewish mathematicians before 1933 and of mathematics and mathematicians during the Nazi time and after May 1945. We hope that the exhibition inspires such questions. There is still much research to be done, following the traces of German-Jewish mathematicians before and after their emigration, reconstructing their reasons for not returning, and examining their contacts with one another after 1945.

Annette Vogt

19 See (Pukelsheim 1996: 44), [Giving up a career on principle – in mathematics, too?], Letter to the editor. This letter was prompted by an article in the Frankfurt Allgemeine Zeitung, No. 165, 19 July 1995: N2.

האוניברסיטה העברית
THE HEBREW UNIVERSITY

THE EINSTEIN INSTITUTE OF MATHEMATICS
WATTENBERG BUILDING
P.O.B. 340 Tel. 874.

מכון איינשטיין למתמטיקה
בית ווטנברג
ת.ד. 340 טל. 874

Jerusalem, 11.2.47. ירושלים,

Professor Kamke
Tübingen.

Dear Colleague,

Feeling the desire of expressing my sincere wishes to the, alas, very few of my former colleagues who have not delivered themselves to Nazism, I should like to send you my kindest personal regards. I assume that Tübingen has suffered less than the big cities during the war, and I confidently hope that you are well. ~~Dating~~ On a recent stay in U.S.A. during a few months, I heard of quite a number of colleagues, but I did not obtain news about you. I wonder if the Tübingen University still works, or if you have gone over to another place.

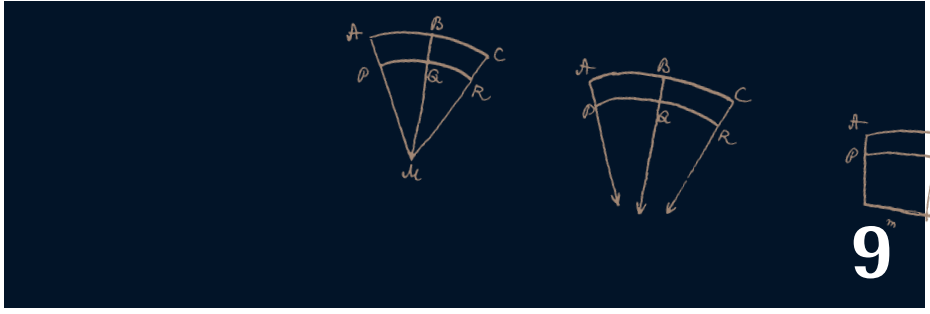
With best wishes, I am

yours sincerely

Abraham Fraenkel

You will understand that I had to decline the call to go back to Kiel. In a country being responsible of the cruel murder of five millions Jews I could not breathe.

Letter from Abraham Fraenkel to Erich Kamke, 11 February 1947



9

Jewish Émigré Mathematicians and Germany

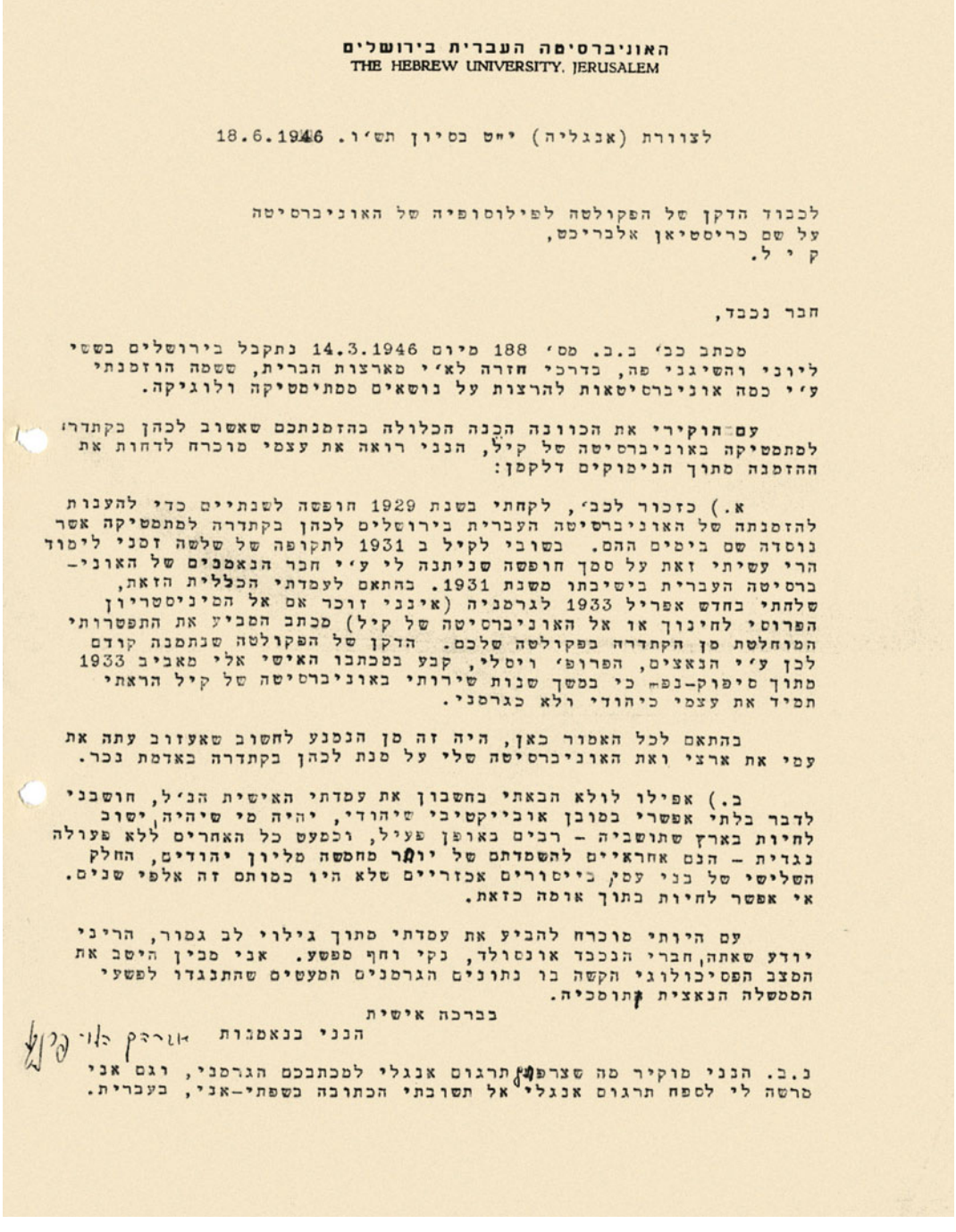
Only a minority of those who fled Germany because of Nazi "racial" persecution returned permanently after 1945.[1] Naturally the process of remigration was highly complex and fraught with psychological, bureaucratic and material obstacles, and returnees must have felt highly vulnerable. Few German universities or academics extended a welcoming hand. The feeling in Germany was quite widespread that emigrants who had left the country were "traitors", and that those who had stayed were now the "victims" of the lost war.

1 See (Krauss 2004: 107).

B. Bergmann et al. (eds.), *Transcending Tradition*

Returning to Germany

Many émigrés understandably never considered going back at all. Abraham Fraenkel, who taught at the Hebrew University in Jerusalem, was very explicit about this. When asked by the University of Kiel in March 1946 whether he would be interested in returning to the position from which he had been dismissed in 1933, he refused because, as he put it later: "In a country being responsible of the cruel murder of five million Jews I could not breathe".[2]



האוניברסיטה העברית בירושלים
THE HEBREW UNIVERSITY, JERUSALEM

לצורת (אנגליה) י"ח בסיון תש'ו. 18.6.1946

לכבוד הדקן של הפקולטה לפילוסופיה של האוניברסיטה
על שם כריסטיאן אלבריכט,
ק י ל.

חבר נכבד,

מכתב כב' ב.ב. מס' 188 מיום 14.3.1946 נתקבל בירושלים בששי ליוני והשיגני פה, בדרכי חזרה לא"י מארצות הברית, ששמה הוזמנתי ע"י כמה אוניברסיטאות להרצות על נושאים מסתימטיקה ולוגיקה.

עם הוקירי את הכוונה הכנה הכלולה בהזמנתכם שאשוב לכהן בקתדרה למתמטיקה באוניברסיטה של קיל, הנני רואה את עצמי מוכרח לדחות את ההזמנה מתוך הניסוקים דלקמן:

א.) כזכור לכב', לקחתי בשנת 1929 חופשה לשנתיים כדי להענות להזמנתה של האוניברסיטה העברית בירושלים לכהן בקתדרה למתמטיקה אשר נוסדה שם בימים ההם. בשובי לקיל ב 1931 לתקופה של שלשה זמני ליסוד הרי עשיתי זאת על סמך חופשה שניתנה לי ע"י חבר הנאמנים של האוניברסיטה העברית ביסיבתו משנת 1931. בהתאם לעמדתי הכללית הזאת, שלחתי בחדש אפריל 1933 לגרמניה (אינני זוכר אם אל המיניסטריון הפרוסי לחינוך או אל האוניברסיטה של קיל) מכתב המביע את התפטרותי המוחלטת מן הקתדרה בפקולטה שלכם. הדקן של הפקולטה שנתמנה קודם לכן ע"י הנאצים, הפרופ' ויסלי, קבע במכתבו האישי אלי מאביב 1933 מתוך סיפוק-נפש כי בפשך שנות שירותי באוניברסיטה של קיל הראתי תמיד את עצמי כיהודי ולא כגרמני.

בהתאם לכל האמור כאן, היה זה מן הנמנע לחשוב שאעזוב עתה את עמי את ארצי ואת האוניברסיטה שלי על מנת לכהן בקתדרה באדמת נכר.

ב.) אפילו לולא הבאתי בחשבון את עמדתי האישית הנ'ל, חושבני לדבר בלתי אפשרי בסובן אובייקטיבי שיהודי, יהיה מי שיהיה, ישוב לחיות בארץ שתושביה - רבים באופן פעיל, וכמעט כל האחרים ללא פעולה נגדית - הנם אחראיים להשמדתם של יותר מחמשה מליון יהודים, החלק השלישי של בני עמי, ביסורים אכזריים שלא היו כמותם זה אלפי שנים. אי אפשר לחיות בתוך אומה כזאת.

עם היותי מוכרח להביע את עמדתי מתוך גילוי לב גמור, הריני יודע שאתה, חברי הנכבד אונסולד, נקי וחף מפשע. אני מבין היטב את המצב הפסיכולוגי הקשה בו נתונים הגרמנים המעטים שהתנגדו לפשעי הממשלה הנאצית ותומכיה.

בברכה אישית
הנני בנאמנות

נ.ב. הנני מוקיר מה שצרפתם תרגום אנגלי לטכתבכם הגרמני, וגם אני מרשה לי לספח תרגום אנגלי אל תשובתי הכתובה בשפתי-אני, בעברית.

2 Letter from Abraham Fraenkel to Erich Kamke, 11 February 1947 (Universitätsarchiv Tübingen).

האוניברסיטה העברית בירושלים
THE HEBREW UNIVERSITY, JERUSALEM

TRANSLATION FROM THE HEBREW.

Letchworth, Herts, (England).
18th June, 1946.

The Dean,
Philosophical Faculty of Christian Albrecht University,
KIEL.

Dear Colleague,

Your letter B. B. No.188 of March 14th, 1946, arrived in Jerusalem on June 6th and reached me here on my way back to Palestine from the U.S.A. where I had been invited by several Universities to deliver lectures on Mathematics and Logic.

Whilst appreciating the fair intentions underlying your invitation to me to reoccupy my former Chair of Mathematics at your University, I have to decline it for the following reasons:

1. As you remember, I took in 1929 a two years leave in order to accept an invitation of the Hebrew University, Jerusalem, for the Chair of Mathematics founded in Jerusalem at that time. When I came back in 1931 for a three term (Semesters)-period, it was in the hope of returning soon to Jerusalem and on a leave granted to me by the Board of Governors of the Hebrew University at its meeting of 1931. In accordance with this general attitude, in April 1933 I sent a letter to Germany (I do not remember whether to the Prussian Ministry of Education or to your University) tendering my final resignation from the Chair in your Faculty. In a personal letter in the spring of 1933, the Dean of the Faculty appointed by the Nazi Regime, Professor Wesle, stated with satisfaction that during my whole service at the Kiel University I had always declared myself to be a Jew and not a German.

In view of all these facts, it would be absurd to expect me now to leave my people, my country and my University for a Chair in another country.

2. Even without, however, taking into consideration my personal attitude described above, I think it would be even from a purely objective point of view, an impossible idea for any Jew to live again in a country whose population - to a large extent actively and for the rest almost entirely passively - has been responsible for the extermination of more than five millions of Jews, the third part of my People, under conditions of cruelty not experienced for thousands of years. It would be intolerable to live among such a nation.

Whilst being compelled to express my attitude in complete frankness, I am conscious of your personal integrity and innocence, dear colleague Unsöld, and I sympathetically understand the difficult psychological situation of a few Germans who opposed the crimes of the Nazi Regime and its followers.

With best personal regards, I am,

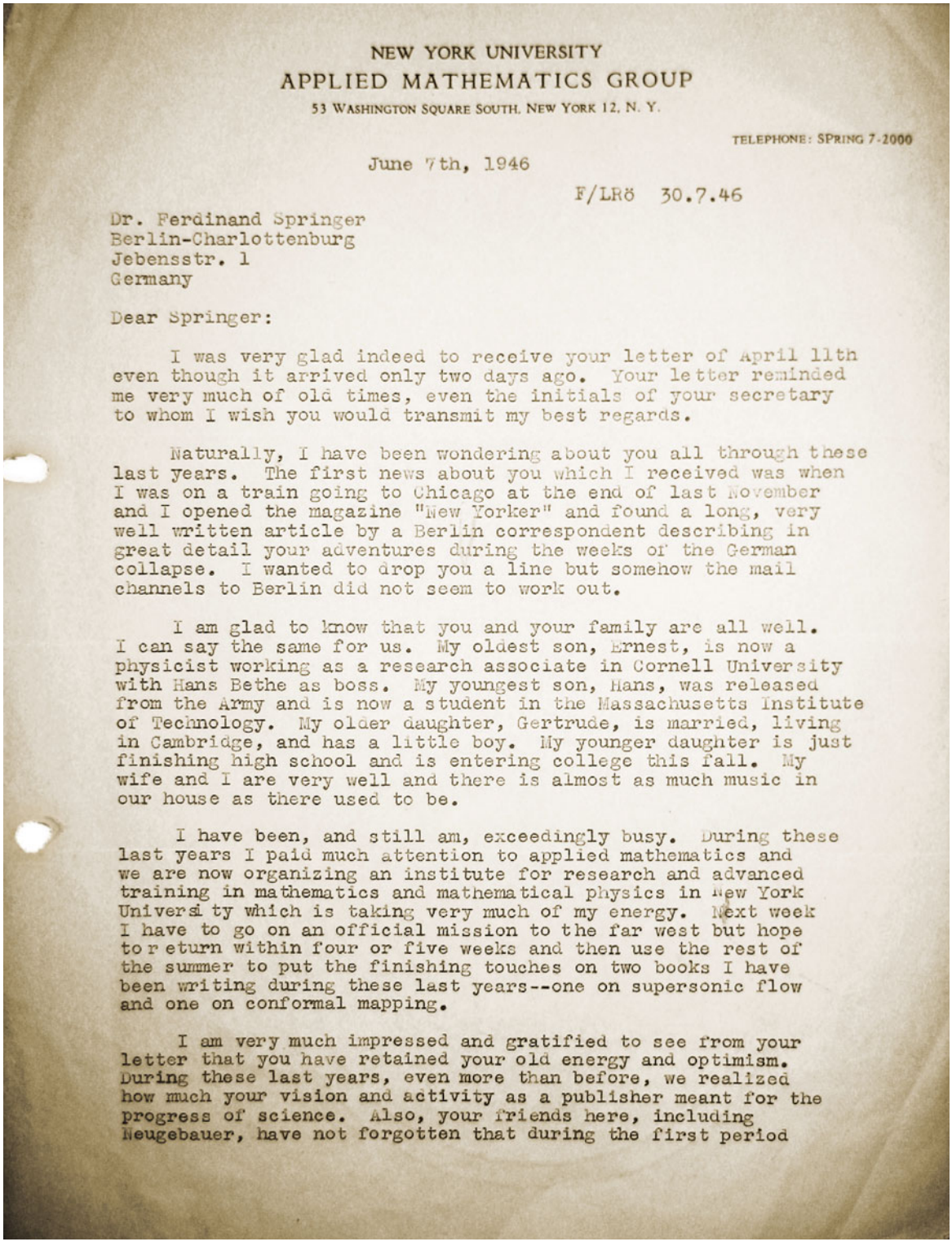
Yours sincerely,
Abraham Adolf Fraenkel
A. A. Fraenkel

P.S. Appreciating your courtesy in attaching an English translation to your German letter, I attach this English translation of my reply written in our own language, Hebrew.

Letter in Hebrew and English from Abraham Fraenkel to Albrecht Unsöld, Dean of the Faculty of Philosophy and Natural Sciences, Kiel University, 18 June 1946

3 Quoted from (Reid 1976: 263).
4 Letter from Abraham Fraenkel to Erich Kamke, 28 September 1947 (Universitätsarchiv Tübingen).

Even for those who may have been willing to return to the land of the Holocaust, living in a country that lay in ruins was not very attractive. Also, facing their former German colleagues and acquaintances was a difficult prospect. Richard Courant for instance, returning to New York from his 1947 visit to Germany, remarked that he "found very few people in Germany with whom an immediate natural contact was possible".[3] As to mathematicians in Germany, in early 1947 Fraenkel thought that only four of them had stood their ground during the Nazi period: Erich Hecke, Erich Kamke, Oskar Perron, and Heinrich Scholz.[4]



NEW YORK UNIVERSITY
APPLIED MATHEMATICS GROUP
53 WASHINGTON SQUARE SOUTH, NEW YORK 12, N. Y.

TELEPHONE: SPRING 7-2000

June 7th, 1946

F/LR8 30.7.46

Dr. Ferdinand Springer
Berlin-Charlottenburg
Jebensstr. 1
Germany

Dear Springer:

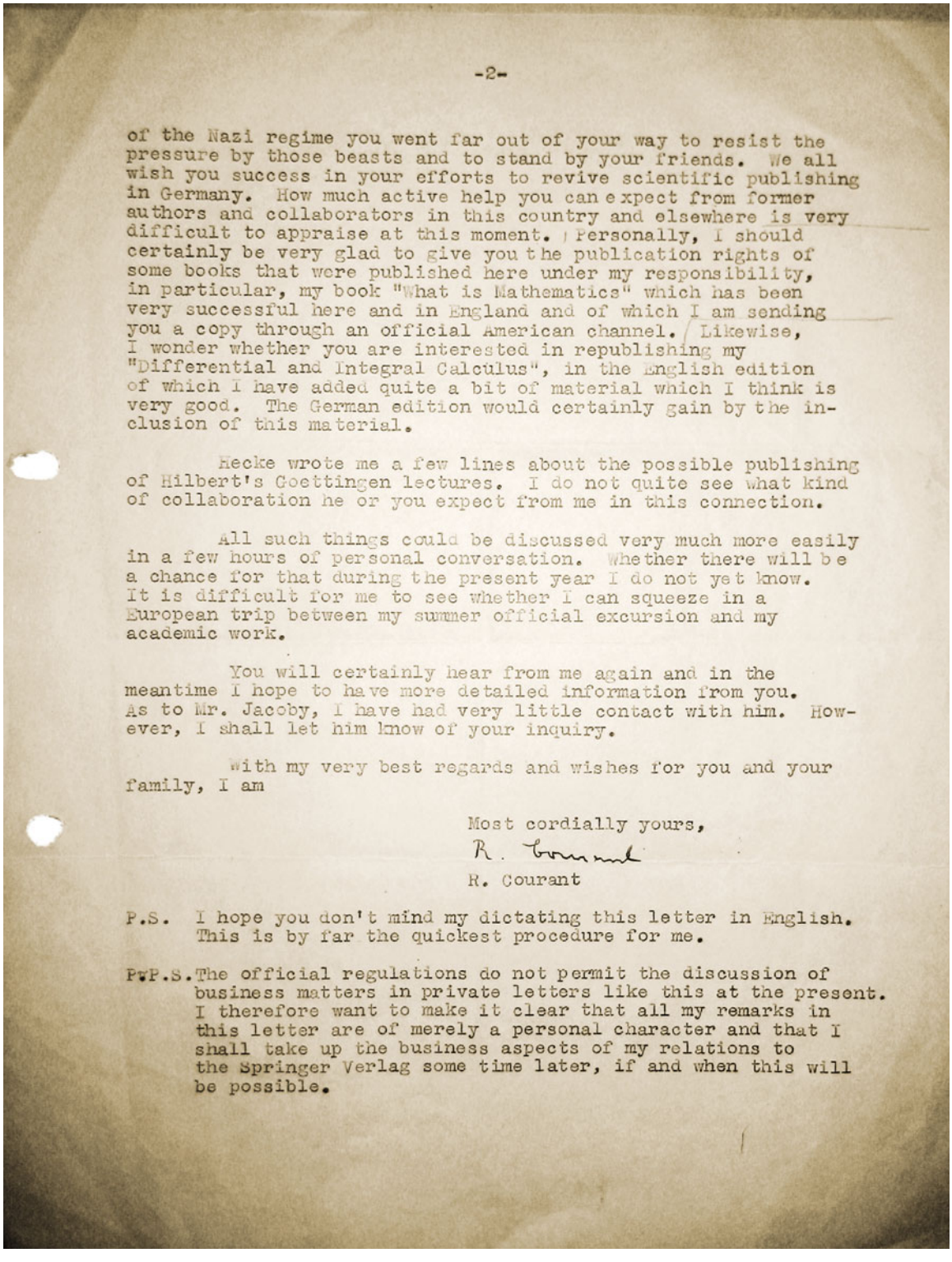
I was very glad indeed to receive your letter of April 11th even though it arrived only two days ago. Your letter reminded me very much of old times, even the initials of your secretary to whom I wish you would transmit my best regards.

Naturally, I have been wondering about you all through these last years. The first news about you which I received was when I was on a train going to Chicago at the end of last November and I opened the magazine "New Yorker" and found a long, very well written article by a Berlin correspondent describing in great detail your adventures during the weeks of the German collapse. I wanted to drop you a line but somehow the mail channels to Berlin did not seem to work out.

I am glad to know that you and your family are all well. I can say the same for us. My oldest son, Ernest, is now a physicist working as a research associate in Cornell University with Hans Bethe as boss. My youngest son, Hans, was released from the Army and is now a student in the Massachusetts Institute of Technology. My older daughter, Gertrude, is married, living in Cambridge, and has a little boy. My younger daughter is just finishing high school and is entering college this fall. My wife and I are very well and there is almost as much music in our house as there used to be.

I have been, and still am, exceedingly busy. During these last years I paid much attention to applied mathematics and we are now organizing an institute for research and advanced training in mathematics and mathematical physics in New York University which is taking very much of my energy. Next week I have to go on an official mission to the far west but hope to return within four or five weeks and then use the rest of the summer to put the finishing touches on two books I have been writing during these last years--one on supersonic flow and one on conformal mapping.

I am very much impressed and gratified to see from your letter that you have retained your old energy and optimism. During these last years, even more than before, we realized how much your vision and activity as a publisher meant for the progress of science. Also, your friends here, including Neugebauer, have not forgotten that during the first period



-2-

of the Nazi regime you went far out of your way to resist the pressure by those beasts and to stand by your friends. We all wish you success in your efforts to revive scientific publishing in Germany. How much active help you can expect from former authors and collaborators in this country and elsewhere is very difficult to appraise at this moment. Personally, I should certainly be very glad to give you the publication rights of some books that were published here under my responsibility, in particular, my book "What is Mathematics" which has been very successful here and in England and of which I am sending you a copy through an official American channel. Likewise, I wonder whether you are interested in republishing my "Differential and Integral Calculus", in the English edition of which I have added quite a bit of material which I think is very good. The German edition would certainly gain by the inclusion of this material.

Hecke wrote me a few lines about the possible publishing of Hilbert's Goettingen lectures. I do not quite see what kind of collaboration he or you expect from me in this connection.

All such things could be discussed very much more easily in a few hours of personal conversation. Whether there will be a chance for that during the present year I do not yet know. It is difficult for me to see whether I can squeeze in a European trip between my summer official excursion and my academic work.

You will certainly hear from me again and in the meantime I hope to have more detailed information from you. As to Mr. Jacoby, I have had very little contact with him. However, I shall let him know of your inquiry.

With my very best regards and wishes for you and your family, I am

Most cordially yours,

R. Courant

R. Courant

P.S. I hope you don't mind my dictating this letter in English. This is by far the quickest procedure for me.

P.P.S. The official regulations do not permit the discussion of business matters in private letters like this at the present. I therefore want to make it clear that all my remarks in this letter are of merely a personal character and that I shall take up the business aspects of my relations to the Springer Verlag some time later, if and when this will be possible.

Letter from Richard Courant to Ferdinand Springer, 7 June 1946. Courant had been the Springer publishing house's main advisor for mathematics from 1918 to the mid-1930s. Until 1939, Springer had supported his Jewish authors and editors against much criticism.

Der Dekan der Phil. und Naturw.
Fakultät

Münster, den 8. März 1946

Die philosophische und naturwissenschaftliche Fakultät bittet den Herrn Oberpräsidenten den durch das Ableben von Herrn Professor Dr. Gerhard Haenzel freigewordenen ordentlichen Lehrstuhl für Mathematik wieder zu besetzen. Gemäss ihrem Vorschlagsrecht legt sie hiermit dem Herrn Oberpräsidenten die folgende Liste vor. Sie nennt an erster Stelle in alphabetischer Reihenfolge die beiden ordentlichen Professoren Hans Rademacher und Friedrich Karl Schmidt.

Dr. Hans Rademacher, Prof. of mathematic
swarthmort Pa, 611 ogden ave U.S.A.

Dr. Friedrich Karl Schmidt, ordentlicher Professor der Mathematik an der Universität Jena
Jena/Thüringen, Weinbergstr.18

Sie nennt an zweiter Stelle den bisherigen ordentlichen Professor Dr. Wilhelm Magnus .

Dr. Wilhelm Magnus
Mathematisches Institut Göttingen
Göttingen, Bunsenstr.3.

Die Fakultät fügt an dritter Stelle wiederum in lexikographischer Anordnung den Professor Dr. Reinhold Baer und den Dozenten Dr. Wilhelm Maack an.

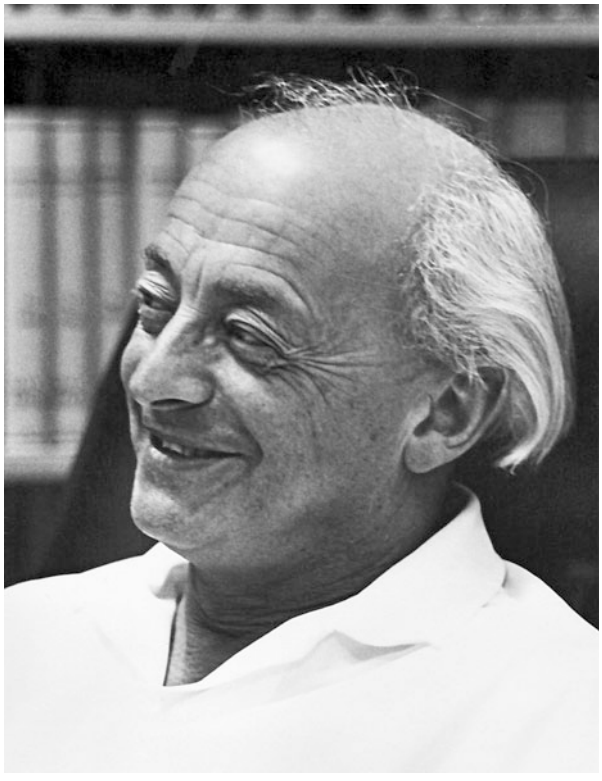
Dr. Reinhold Baer, Prof.ofmathematic
Universty of Illinois in Urbana
Ill. Doz.1

Dozent Dr. Wilhelm Maack
Hamburg-Othmarschen,Rethelstr.4.

Von den 5 genannten sind 4 politischen und rassischen Verfolgungen ausgesetzt gewesen.

Letter from Heinrich Behnke, Dean of the Faculty of Philosophy and Natural Sciences, to Clemens Steinbicker, Curator of Münster University, shortlist for the professorship of mathematics, Münster, 8 March 1946

In this context it was rather exceptional that Heinrich Behnke in Münster considered Jewish émigré mathematicians at all when he had a professorship to fill in early 1946. He had originally intended to include Hans Arnold Heilbronn (then in Bristol) and Reinhold Baer (who was in Urbana, Illinois) among the candidates being considered, but eventually only Baer was included – though not very high on the list. It was generally known that Heilbronn was not interested in coming back to Germany at all.



Reinhold Baer

In the end, only three mathematicians returned to a German university: Friedrich Wilhelm Levi went to Berlin in 1952; Hans Hamburger (1889-1956) returned to Cologne in 1953 (where he had taught up to 1935); and Reinhold Baer accepted a professorship in Frankfurt am Main in 1956, where he then had many prominent doctoral students and became an important part of the German mathematical community. While Hamburger succeeded in reclaiming his old position in Cologne, this was not an option for Baer and Levi, who had not held permanent positions at the time of their emigration. They made their way back to Germany through visiting professorships and lecturing trips while considering the option of a possible return. Both found helpful colleagues in Germany who supported their wish to return. Baer and his family had settled in the USA but felt drawn back to Germany. He was appointed at Frankfurt University in 1956. Levi was very unhappy with his unstable situation in India. After reaching the retirement age of 60 in Calcutta in 1948, he had secured temporary contracts at the Tata Institute for Fundamental Research in Bombay. While he was well respected in India, he was keen on returning to Europe. He gave a series of talks in England, the Netherlands and Germany in 1950 and held visiting professorships in Freiburg (1951) and Berlin (1952). The mathematician Alexander Dinghas (1908-1974) at the newly founded Freie Universität in Berlin was determined to hire Levi and succeeded in doing so in 1952 in spite of opposition from the administration – a standard problem in all similar cases – who considered Levi "too expensive" given his age and upcoming retirement.

Reinhold Baer

Collier Cottage
Estes Park, Colorado,
den 26. Juni 1951.

Lieber Herr Süss,

wie Sie sehen, bringen wir diesen Sommer wieder in "unserm" Blockhäuschen in den Rockies zu. Nach den Schwelgereien in Europens Schönheit im vergangenen Sommer kommen wir uns sehr "brav und bürgerlich" vor; denn hier ist es zwar ruhig und friedlich, aber doch recht bescheiden.

Ich komme heute mit einer Bitte um Rat, den Sie uns bei unserm vorjährigen Besuch so freundlich angeboten haben. Wie Sie wissen, steht mir seit langem ein Urlaubsjahr zu; und ich möchte dieses gern im Mitteleuropäischen Geistesbezirk zubringen. Der Gründe sind viele; vom sentimentalen und ästhetischen bis zum intellektuellen und mathematischen. Um besonders in letzterer Hinsicht alles nur mögliche aus einem solchen Urlaubsjahr herauszupressen, glaube ich, mich einmal wieder richtig der dortigen akademischen Gemeinde eingliedern zu sollen. Die in dieser Hinsicht mitgenommenen Erinnerungen bedürfen einer Auffrischung, da Gesichtspunkte und Wertemphasen hier doch recht anders sind - auch wenn, wie ich mir denke, das Europäische Geistesleben in den Katastrophen und Verführungen der letzten 18 Jahre reichlicher Amerikanisierung ausgesetzt war. Wie sich eine solche zeitweise Eingliederung in etwa die Deutsche Akademia am besten organisieren lässt, übersehe ich nicht ganz; und hier wäre ich für Ihren Rat sehr dankbar. - Abgesehen von den intellektuellen Problemen entsteht auch ein materielles Problem. Während eines solchen Urlaubsjahres zahlt die Universität mir nur das halbe Gehalt [und das Zusatzeinkommen meiner Frau verschwindet ganz]. Der verbleibende Betrag mag in Europa ganz respektabel erscheinen und sein; doch habe ich hier natürlich laufende Verpflichtungen, die einen erheblichen Anteil meines Einkommens ständig aufsaugen, abgesehen von Reisekosten und der nicht nur erwünschten, sondern fast notwendigen Beweglichkeit innerhalb Europas. All das fordert allerlei Planen und es entstehen Probleme, deren Lösbarkeit ich so wenig übersehe, dass ich mich an Sie um Rat wende.

Zu Ihrer Information noch die folgende Bemerkung: Unser akademische Jahr hier läuft vom September zum September; und wegen der Sommerferien bedeutet das, dass ich von Anfang Juni 1952 bis Anfang September 1953 in Europa sein würde. Das Urlaubsgesuch muss ich Ende dieses oder Anfang nächsten Jahres einreichen; und dabei muss ich meine Pläne im einzelnen angeben - wo ich was zu tun beabsichtige. Wie Sie sehen, sind das alles langwierige Angelegenheiten, die rechtzeitig vorbereitet sein wollen.

Sie werden sich vielleicht wundern, warum wir nicht bereits im kommenden akademischen Jahr Urlaub genommen haben, wie wir wohl in unsern Freiburger Unterhaltungen angedeutet hatten. Wie wir im vergangenen Herbst aus Europa heimkehrten, war ich durch die politische Lage im allgemeinen und insbesondere durch die heimische Reaktion auf die Ereignisse derart vor den Kopf geschlagen, dass ich mich zu nichts habe aufraffen können. Inzwischen sind natürlich weder die politische Weltlage noch die Heimatatmosphäre in irgendeiner Hinsicht besser geworden; aber man gewöhnt sich wohl an alles; und ich möchte jedenfalls eine Gelegenheit ergreifen, von der man ja nicht weiss, ob es nicht die letzte ist.

Letter from Reinhold Baer to Wilhelm Süss, 26 June 1951

Reinhold Baer

Collier Cottage
Estes Park, Colorado
26 June 1951

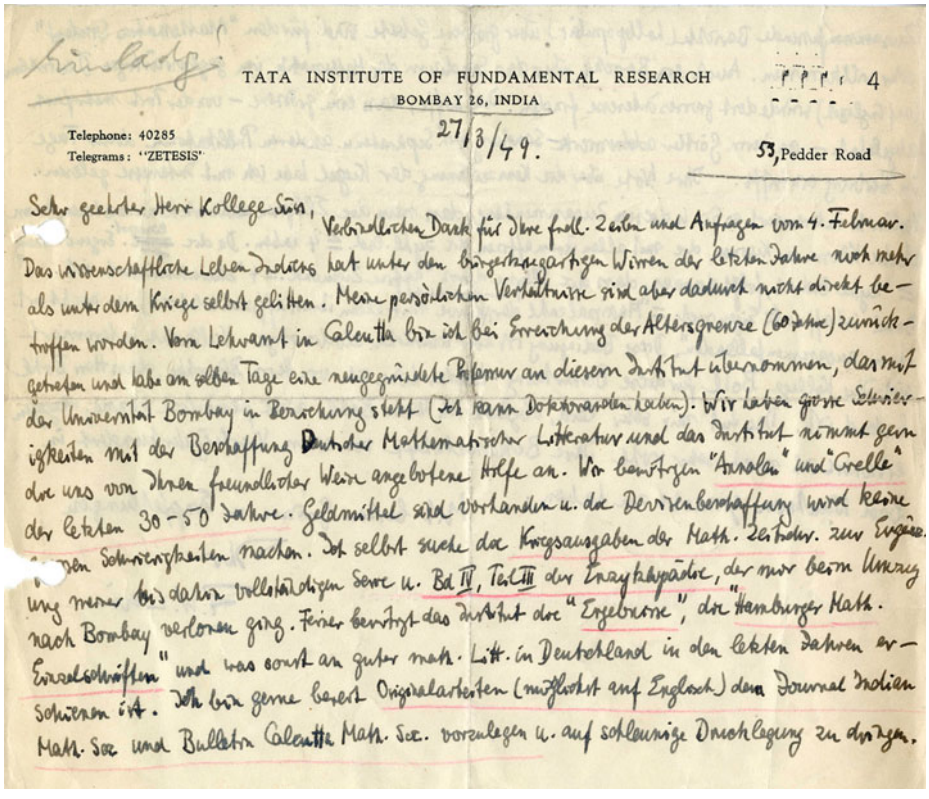
Dear Mr. Süss,

[...]

Today I would like to ask your advice, as you had offered it to us so generously at the occasion of our visit last year. As you know, I have for quite a while been entitled to a sabbatical year, and I would like to spend this year in the intellectual realm of Central Europe. There are many reasons: some sentimental and esthetic, some intellectual and mathematical. And in order to squeeze the greatest benefit from this year, particularly concerning the latter reasons, I feel that I should once again fully integrate myself into the local academic community. The memories I have in this respect need to be refreshed, as the approaches and values here are quite different – even though I am sure that, after the catastrophes and enticements of the last 18 years, European intellectual life has been exposed to ample Americanization. I cannot quite estimate how such a temporary inclusion into German academia can be organized, and this is where I would be grateful for your advice. Apart from the intellectual problems, there is also a material problem. For the duration of such a sabbatical year the university will pay only half of my salary (and my wife's additional income will disappear completely). The remaining amount may be considered quite sufficient in Europe, but I do have running expenses here that absorb quite a proportion of my income on a regular basis, not to mention travel expenses and a certain necessary, not only desirable, degree of mobility in Europe. All of this will require careful planning, and there are some problems for which I cannot adequately envision solutions, and for this reason I am turning to you for advice.

[...]

Letter from Friedrich Wilhelm Levi to Wilhelm Süss, 27 March 1949



TATA INSTITUTE OF FUNDAMENTAL RESEARCH
BOMBAY 26, INDIA

Telephone: 40285
Telegrams: "ZETESIS"

27/3/49.

53, Pedder Road

Sehr geehrter Herr Kollege Süss,

Verbindlichen Dank für Ihre freundl. Zeilen und Anfragen vom 4. Februar. Das wissenschaftliche Leben Indiens hat unter den bürgerkriegartigen Wirren der letzten Jahre noch mehr als unter dem Kriege selbst gelitten. Meine persönlichen Verhältnisse sind aber dadurch nicht direkt betroffen worden. Vom Lehramt in Calcutta bin ich bei Erreichung der Altersgrenze (60 Jahre) zurückgetreten und habe am selben Tage eine neugegründete Professur an diesem Institut übernommen, das mit der Universität Bombay in Verbindung steht (ich kann Doktoranden haben). Wir haben grosse Schwierigkeiten mit der Beschaffung deutscher Mathematischer Literatur und das Institut nimmt gern die uns von Ihnen freundlicher Weise angebotene Hilfe an. Wir benützen "Annalen" und "Crelle" der letzten 30–50 Jahre. Geldmittel sind vorhanden u. die Devisenbeschaffung wird keine allzu grossen Schwierigkeiten machen. Ich selbst suche die Kriegsausgaben der Math. Zeitschr. zur Ergänzung meiner bis dahin vollständigen Serie u. Bd IV, Teil III der Encyklopädie, der mir beim Umzug nach Bombay verloren ging. Ferner benötigt das Institut die "Ergebnisse", die "Hamburger Math. Einzelschriften" und was sonst an guter math. Litt. in Deutschland in den letzten Jahren erschienen ist. Ich bin gerne bereit Originalarbeiten (möglichst auf Englisch) dem Journal Indian Math. Soc. und Bulletin Calcutta Math. Soc. vorzulegen u. auf schleunige Durchlegung zu dringen.

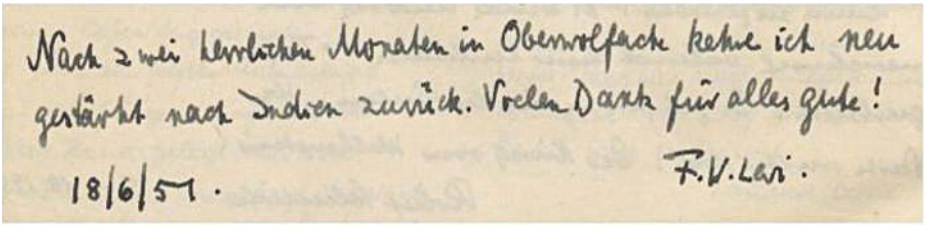
Zusammenfassende Berichte (halbpopulär) über grössere Gebiete sind für den "Mathematics Student" sehr willkommen. Auch ein Bericht über das Studium der Mathematik im gegenwärtigen Deutschland (auf Englisch) würde dort grosses Interesse finden. Ich hoffe, dass eine grössere – von der Post mehrfach abgelehnte – an Herrn Görtler adressierte Sendung von Separaten u. anderen Publikationen dieser Tage in Freiburg eintrifft. Ihre Note über die Kennzeichnung der Kugel habe ich mit Interesse gelesen. Vielleicht interessiert es Sie in diesem Zusammenhang, dass man die Ellipsen dadurch kennzeichnen kann, als die Klasse der Kurven, die mit allen ihren affinen die zahl. Ord. ≤ 4 haben. Da die ~~Ellipse~~ Ergänzung $\geq$ zahl. Ord ist, folgt daraus, dass die Ellipse durch "affine Eigenord. $= 4$" charakterisiert ist. Dabei ist affine Eigenord. = "Maximalzahl der (kompliziertheit) Kurve mit allen ihren affinen (det $= 1$) u. nicht mit ihnen zusammenfallenden". Diese Bedingung ist aber schwächer als die obige. Vielleicht interessiert sich Ihr Kollege Bohl für diese Bemerkung. Leider höre ich von Herrn Blaschke, dass Herr Bohl leidend ist. Das tut mir sehr leid, obgleich ich Herrn Bohl nicht persönlich kenne, dagegen erinnere ich mich sehr wohl Ihre Bekanntschaft vor einem Vierteljahrhundert in Bad Nauheim gemacht zu haben.

Mit besten Grüssen u. Empfehlungen

Ihr

F. W. Levi.

Thank you very much for your very friendly letter and your request of 4 February. Academic life in India has suffered even more from the civil-war-like conditions of recent years than from the war itself. However, my personal situation has not been affected directly. After having reached the age limit (60 years), I resigned from my teaching position in Calcutta, and on that same day I accepted a newly founded professorship at this institute, which is connected with the University of Bombay (I can have doctoral students). We have great difficulties with the acquisition of German mathematical literature, and the institute shall be glad to accept your proffered assistance.


Nach zwei herrlichen Monaten in Oberwolfach kehre ich neu gestärkt nach Indien zurück. Vielen Dank für alles gute!
18/6/51. F. W. Levi.

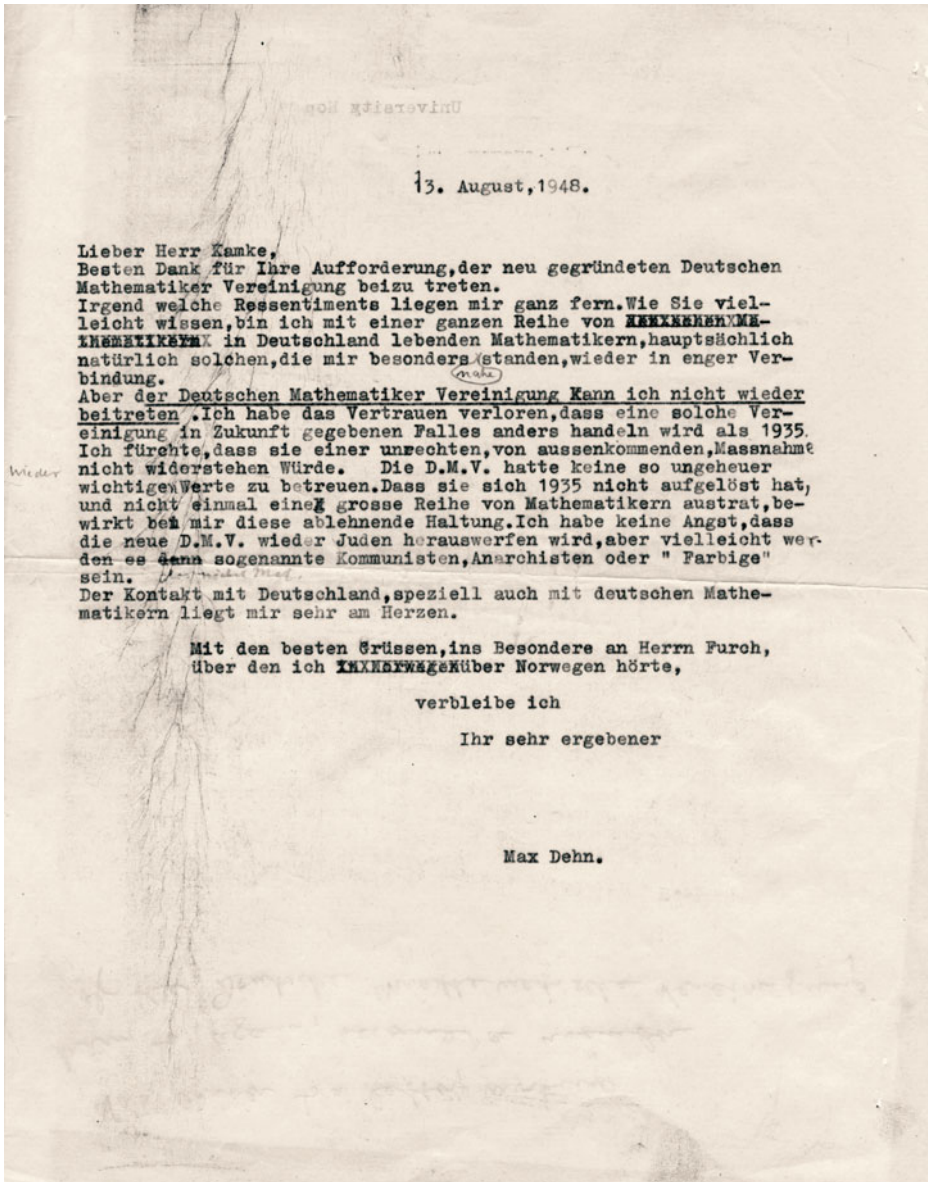
Entry by Friedrich Wilhelm Levi in the guest book of the Mathematical Research Institute of Oberwolfach, 18 June 1951

After two splendid months in Oberwolfach and greatly invigorated I now return to India. Thank you very much for all the good things!

The German Mathematical Society (DMV) and Jewish mathematicians in the postwar period

The DMV was reestablished in the French occupation zone in 1948 by the mathematician Erich Kamke (1890-1961), who had lost his professorship in 1937 because his wife was Jewish. After World War II, Kamke severed all ties to the "old" DMV and its leaders, pointing to its treatment of Jewish members in 1938. In June 1948, he wrote to mathematicians who had been expelled from the association in 1938 in his capacity as chairman of the "new" DMV, inviting them to rejoin the society. Among the replies he received, Max Dehn's refusal stands out as particularly critical in its assessment of the society's role in the Nazi period. Nevertheless, Dehn wrote: "Contact with Germany, especially with German mathematicians, is very dear to my heart".[5]

Letter from Max Dehn to Erich Kamke, 13 August 1948



13. August, 1948.

Lieber Herr Kamke,
Besten Dank für Ihre Aufforderung, der neu gegründeten Deutschen Mathematiker Vereinigung beizu treten.
Irgend welche Ressentiments liegen mir ganz fern. Wie Sie vielleicht wissen, bin ich mit einer ganzen Reihe von [illegible] in Deutschland lebenden Mathematikern, hauptsächlich natürlich solchen, die mir besonders nahe standen, wieder in enger Verbindung.
Aber der Deutschen Mathematiker Vereinigung kann ich nicht wieder beitreten. Ich habe das Vertrauen verloren, dass eine solche Vereinigung in Zukunft gegebenen Falles anders handeln wird als 1935. Ich fürchte, dass sie einer unrechten, von aussenkommenden, Massnahme nicht widerstehen würde. Die D.M.V. hatte keine so ungeheuer wichtigen Werte zu betreuen. Dass sie sich 1935 nicht aufgelöst hat, und nicht einmal eine grosse Reihe von Mathematikern austrat, bewirkt bei mir diese ablehnende Haltung. Ich habe keine Angst, dass die neue D.M.V. wieder Juden herauswerfen wird, aber vielleicht werden es dann sogenannte Kommunisten, Anarchisten oder " Farbige" sein.
Der Kontakt mit Deutschland, speziell auch mit deutschen Mathematikern liegt mir sehr am Herzen.

Mit den besten Grüssen, ins Besondere an Herrn Furch, über den ich [illegible] über Norwegen hörte,

verbleibe ich

Ihr sehr ergebener

Max Dehn.

5 Letter from Max Dehn to Erich Kamke, 13 August 1948, in: Max Dehn Papers, box 2, no. 55, (Austin, Archives of American Mathematics).

13 August 1948

Dear Mr. Kamke,
Thank you very much for your invitation to join the newly founded German Mathematical Society [DMV].
I bear no grudge of any kind. As you may be aware, I am once again in close contact with several mathematicians in Germany, of course primarily with those whom I was particularly close to.
But I cannot rejoin the German Mathematical Society. I have lost the confidence that such an association would act differently in the future than it did in 1935. I fear it would, once again, not resist an unjust measure coming from outside. The DMV did not have the custody of very important values. My negative impression is caused by the fact that it did not dissolve itself in 1935 and that not even a considerable number of mathematicians left the association. I am not afraid that the DMV will once again expel Jews, but perhaps next time it will be so-called communists, anarchists or "colored people".
Contact with Germany, especially with German mathematicians, is very dear to my heart.
With best regards, particularly to Mr. Furch,
about whom I heard via Norway,

Very faithfully yours

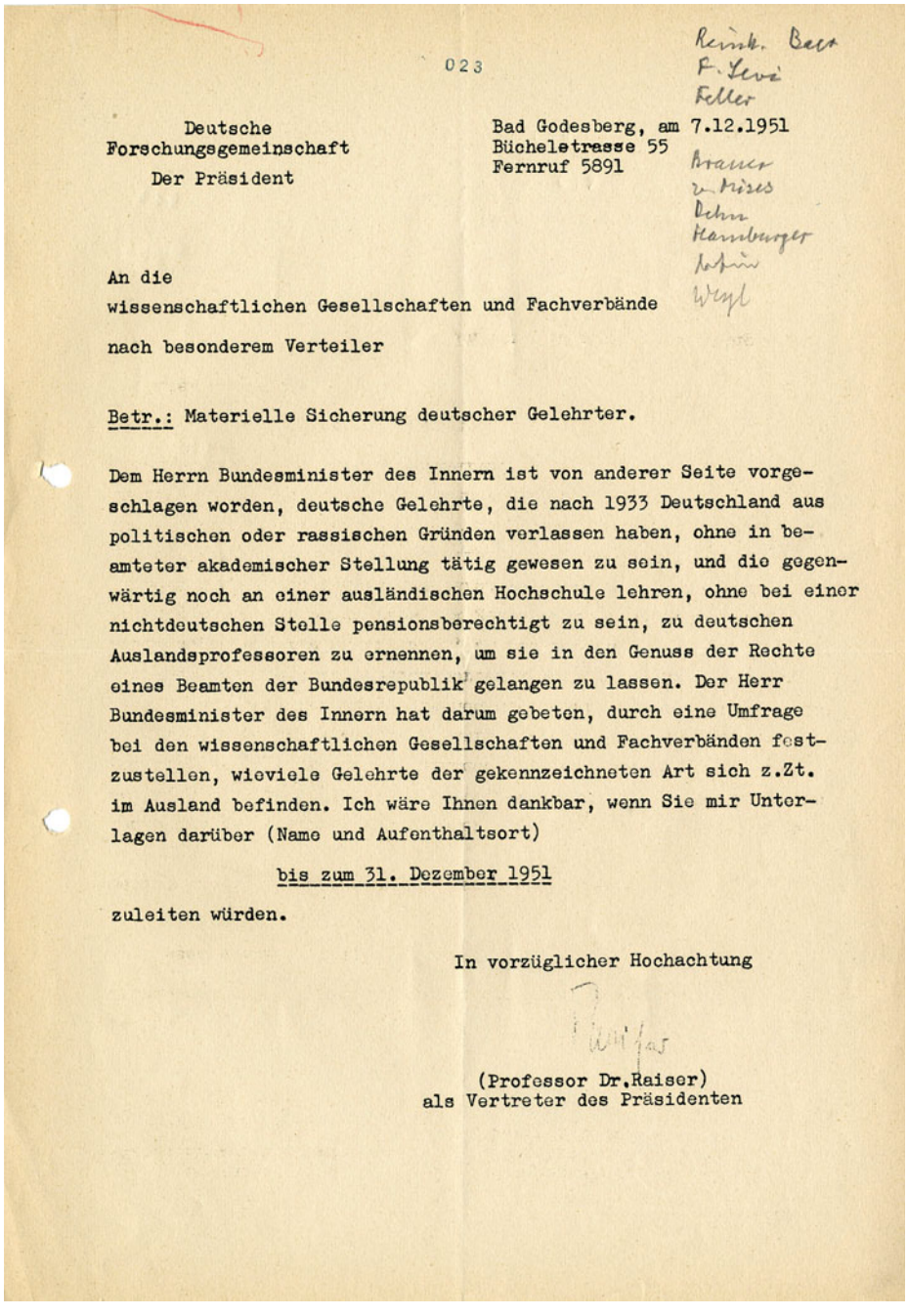
Max Dehn

Such words were not lost on Kamke. When the publication of *Jahresbericht der DMV* was resumed in 1951 after a lapse of 8 years, Kamke insisted on publishing a memorial table (Gedenktafel) commemorating those mathematicians who had died since 1933, and in particular those who had not been honored by an obituary. Moreover, he made a bow of reverence to "the 30 or so colleagues who under the pressure of the circumstances were forced to emigrate. We still feel connected to them", he wrote, "and we send our cordial regards".[6] In January 1951, Abraham Fraenkel acknowledged receipt of the *Jahresbericht*, expressed his pleasure about the democratic spirit of the DMV and the memorial table. Still, he refused to rejoin.[7]

Generally speaking, no systematic efforts were undertaken to open ways back into German universities for émigré academics. And only rarely were they invited to return to their old positions. Rather, the situation in German universities was cemented in 1951, when a law was passed that allowed most of those German professors who had lost their jobs during the denazification process to be reinstated. Later that year, the Germany Ministry of the Interior made an offer to academics who had not held permanent positions and who had been expelled during the Nazi period. Only people who had been teaching at universities in the meantime but had no pension rights outside Germany were considered. While these restrictions (and the three-week deadline for replies) made the group in question quite small, this may be seen as a first step toward the so-called "Wiedergutmachung" [compensation] that took place in the mid-1950s.[8]

6 (Kamke 1951: 1).
7 Letter from Abraham Fraenkel to Erich Kamke, 29 January 1951 (Universitätsarchiv Tübingen).
8 On the topic of compensation see (Goschler 2005).

DMV president Kamke immediately took action when he learned about this. Within four weeks he submitted a "List of mathematicians who had been compelled to leave Germany by the NS regime", at the same time pointing to the fact that the amount of compensation being offered was not sufficient and was bound to create bad feelings among some of those concerned. Indeed, the question of compensation was a source of frustration to many. Max Dehn, for instance, died in 1952 without having succeeded in getting compensation. His former Frankfurt colleague, science historian Willy Hartner, put it bluntly in Dehn's obituary in the *Frankfurter Allgemeine Zeitung*: "The carelessly neglected opportunity of compensation imposes a severe moral liability for our young republic."[9] While the process of getting compensation was in most cases rather cumbersome and often frustrating (as for Kurt Friedrichs and Richard Courant) it sometimes went through smoothly (as Werner Fenchel experienced in 1956).[10]



023

Reinh. Baer
F. Levi
Feller

Deutsche
Forschungsgemeinschaft
Der Präsident

Bad Godesberg, am 7.12.1951
Bücheletrasse 55
Fernruf 5891

Brauer
v. Mises
Dehn
Hamburger
Lotzin
Weyl

An die
wissenschaftlichen Gesellschaften und Fachverbände

nach besonderem Verteiler

Betr.: Materielle Sicherung deutscher Gelehrter.

Dem Herrn Bundesminister des Innern ist von anderer Seite vorgeschlagen worden, deutsche Gelehrte, die nach 1933 Deutschland aus politischen oder rassischen Gründen verlassen haben, ohne in beamteter akademischer Stellung tätig gewesen zu sein, und die gegenwärtig noch an einer ausländischen Hochschule lehren, ohne bei einer nichtdeutschen Stelle pensionsberechtigt zu sein, zu deutschen Auslandsprofessoren zu ernennen, um sie in den Genuss der Rechte eines Beamten der Bundesrepublik gelangen zu lassen. Der Herr Bundesminister des Innern hat darum gebeten, durch eine Umfrage bei den wissenschaftlichen Gesellschaften und Fachverbänden festzustellen, wieviele Gelehrte der gekennzeichneten Art sich z.Zt. im Ausland befinden. Ich wäre Ihnen dankbar, wenn Sie mir Unterlagen darüber (Name und Aufenthaltsort)

bis zum 31. Dezember 1951

zuleiten würden.

In vorzüglicher Hochachtung

(Professor Dr. Raiser)
als Vertreter des Präsidenten

Letter from the president of the German Research Foundation to all scientific and academic societies and federations, 7 December 1951. Hand-written preliminary list of names by Erich Kamke at the top right corner

9 Quoted from (Siegmund-Schultze 2009: 339).
10 On these three see (Szabó 2000: 320f., 420f., 463f.).

German Research Foundation
The President

Bad Godesberg, 7 December 1951
Büchelstrasse 55
Telephone 5891

[Handwritten:]
Reinh. Baer
F. Levi
Feller
Brauer
v. Mises
Dehn
Hamburger
Artin
Weyl

Addressed to the scientific societies and professional associations
By special mailing list
Re: Financial security for German scholars.

It has been proposed to the Federal Minister of the Interior that German scholars who for political or racially-motivated reasons left Germany after 1933 without having held tenured academic positions and who are now teaching at universities abroad but are not entitled to receive a pension from sources outside Germany should be awarded the title of German professors abroad in order that they may be provided with the legal rights of a German public servant. The Federal Minister of the Interior has therefore requested that a survey be conducted among scientific societies and professional associations in order to determine the number of scholars fulfilling the conditions described above who are currently abroad. I would be grateful if you could send me information (name and place of residence) on such cases

by 31 December 1951.

Yours faithfully

Professor Dr. Raiser
on behalf of the President

DEUTSCHE MATHEMATIKER-VEREINIGUNG

Tübingen, den 10.12.51

An den
Herrn geschäftsführenden Direktor
des Mathematischen Instituts 013

Sehr geehrter Herr Kollege!

Es wird erwogen, deutsche Gelehrte, die nach 1933 Deutschland aus politischen oder rassischen Gründen verlassen haben, ohne in beamteter akademischer Stellung tätig gewesen zu sein, und die gegenwärtig noch an einer ausländischen Hochschule lehren, ohne bei einer deutschen Stelle pensionsberechtigt zu sein, zu deutschen Auslandsprofessoren zu ernennen, um sie in den Genuß der Rechte eines deutschen Beamten gelangen zu lassen, und zwar soll diese Angelegenheit schnell bearbeitet werden. Ich muß darüber noch vor Weihnachten einen Bericht abgeben. Bei dieser Gelegenheit möchte ich auf alle Kollegen hinweisen, die nach 1933 Deutschland verlassen mußten und noch nicht wieder zurückgekehrt sind. Ich bitte Sie daher, mir umgehend folgende Fragen zu beantworten (gegebenenfalls bitte ich um eine Fehlanzeige): Name und Vorname, Geburtsort und -jahr, letzte Stellung an Ihrer Hochschule, wann ausgeschieden und aus welchen Gründen, ist Rückkehr nach Deutschland erfolgt, ist Emeritierung in Deutschland erfolgt, an welcher Hochschule jetzt tätig, besteht ein Pensionsanspruch?

Ich bitte auch die Herren Kollegen der Hochschulen der Ostzone mir diese Fragen zu beantworten, damit die DMV einen Ueberblick über alle Fälle hat.

Mit freundlichem Gruß

Ihr

(Prof. Dr. Kamke)

Letter from DMV president Erich Kamke to all institutes of mathematics, 10 December 1951

GERMAN MATHEMATICAL SOCIETY

Tübingen, 10 December 51

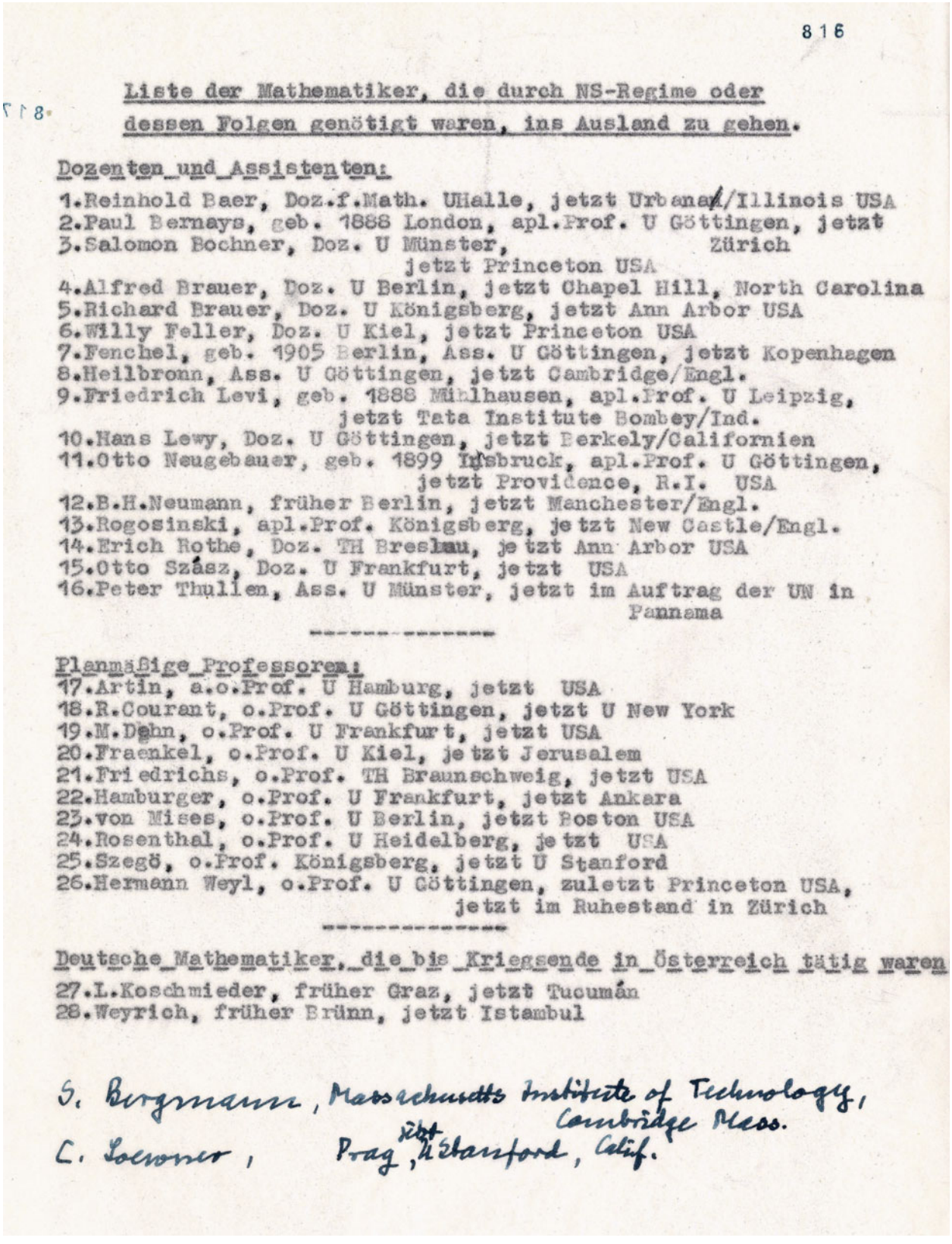
Addressed to the
Managing Director
of the Mathematical Institute

Dear Colleague!

Proposals have been made that German scholars who for political or racially motivated reasons left Germany after 1933 but before being tenured in their academic positions, who are now teaching at universities abroad and who are not entitled to receive a German pension could be awarded the title of German professors abroad in order to provide them with the legal rights of a German public servant. This matter needs to be processed as quickly as possible. I will need to present a report on it before Christmas. I would like to include in my report all colleagues who had to leave Germany after 1933 and who have not yet returned.
I would therefore ask you to answer the following questions immediately (if applicable, also send negative reports): name and first name, place and date of birth, last position held at your university, date of departure and reason for departure, return to Germany (if applicable), emeritus in Germany or not, university of current position, and is there a pension claim?
I also ask colleagues at universities in the Eastern Zone to send me answers to these questions in order to provide the German Mathematical Society with an overview of all cases.

With best wishes

Prof. Dr. Kamke



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Liste der Mathematiker, die durch NS-Regime oder dessen Folgen genötigt waren, ins Ausland zu gehen.

Dozenten und Assistenten:

1. Reinhold Baer, Doz. f. Math. U Halle, jetzt Urbana/Illinois USA
2. Paul Bernays, geb. 1888 London, apl. Prof. U Göttingen, jetzt Zürich
3. Salomon Bochner, Doz. U Münster, jetzt Princeton USA
4. Alfred Brauer, Doz. U Berlin, jetzt Chapel Hill, North Carolina
5. Richard Brauer, Doz. U Königsberg, jetzt Ann Arbor USA
6. Willy Feller, Doz. U Kiel, jetzt Princeton USA
7. Fenchel, geb. 1905 Berlin, Ass. U Göttingen, jetzt Kopenhagen
8. Heilbronn, Ass. U Göttingen, jetzt Cambridge/Engl.
9. Friedrich Levi, geb. 1888 Mühlhausen, apl. Prof. U Leipzig, jetzt Tata Institute Bombey/Ind.
10. Hans Lewy, Doz. U Göttingen, jetzt Berkely/Californien
11. Otto Neugebauer, geb. 1899 Innsbruck, apl. Prof. U Göttingen, jetzt Providence, R.I. USA
12. B.H. Neumann, früher Berlin, jetzt Manchester/Engl.
13. Rogosinski, apl. Prof. Königsberg, jetzt New Castle/Engl.
14. Erich Rothe, Doz. TH Breslau, jetzt Ann Arbor USA
15. Otto Szász, Doz. U Frankfurt, jetzt USA
16. Peter Thullen, Ass. U Münster, jetzt im Auftrag der UN in Pannama

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Planmäßige Professoren:

17. Artin, a.o. Prof. U Hamburg, jetzt USA
18. R. Courant, o. Prof. U Göttingen, jetzt U New York
19. M. Dehn, o. Prof. U Frankfurt, jetzt USA
20. Fraenkel, o. Prof. U Kiel, jetzt Jerusalem
21. Friedrichs, o. Prof. TH Braunschweig, jetzt USA
22. Hamburger, o. Prof. U Frankfurt, jetzt Ankara
23. von Mises, o. Prof. U Berlin, jetzt Boston USA
24. Rosenthal, o. Prof. U Heidelberg, jetzt USA
25. Szegö, o. Prof. Königsberg, jetzt U Stanford
26. Hermann Weyl, o. Prof. U Göttingen, zuletzt Princeton USA, jetzt im Ruhestand in Zürich

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Deutsche Mathematiker, die bis Kriegsende in Österreich tätig waren

27. L. Koschmieder, früher Graz, jetzt Tucumán
28. Weyrich, früher Brünn, jetzt Istambul

S. Bergmann, Massachusetts Institute of Technology, Cambridge Mass.
C. Loewner, Prag, jetzt Stanford, Calif.

Letter from DMV president Erich Kamke to the president of the German Research Foundation, 5 January 1952. In the cover letter, Erich Kamke welcomed the initiative of the Ministry but voiced his disappointment about the details. One should, he stressed, not be too petty ("engherzig") and be aware of the fact that in most cases the losses and "emotional sufferings" could never be compensated by material means.

The Oberwolfach Mathematical Research Institute in the 1950s

Mathematisches Forschungsinstitut Oberwolfach as a meeting point

The Mathematical Research Institute at Oberwolfach was founded in late 1944 as a national institute for mathematics ("Reichsinstitut für Mathematik") with the objective of conducting important research for the war effort. The moving force behind the foundation and first director of the institute was Wilhelm Süss, president of the DMV between 1937 and 1945, SA member since 1933 and NSDAP member since 1937. In 1938, he had been instrumental in excluding Jewish members from the DMV. After the war, Süss quickly readjusted his policies. He now wanted to clear the Oberwolfach institute of its war-related history and transform it into an international meeting place for mathematicians.[11] Starting in 1948, he deliberately began approaching Jewish émigré mathematicians and inviting them to Oberwolfach.

Erich Kamke (left) and Hubert Cremer (right)

11 On this see (Epple; Remmert; Karachalios 2005).

"Topology meeting" 1949: from left Karl Stein, Hellmuth Kneser, Heinz Hopf

Regular conferences were held in Oberwolfach from 1949 onwards. Of the three workshops held in 1949, two centered on eminent Jewish mathematicians: the attraction of the topology workshop in April was Heinz Hopf (1894-1971), who had taught in Zurich since 1931 and had first visited Oberwolfach in 1946. The meeting on mathematical logic was chaired by Paul Bernays (1888-1977), Hilbert's colleague who had lost his position in Göttingen in 1933. These workshops, along with a Franco-German meeting in August 1949, were of great importance for the reintegration of German mathematicians into the international community.

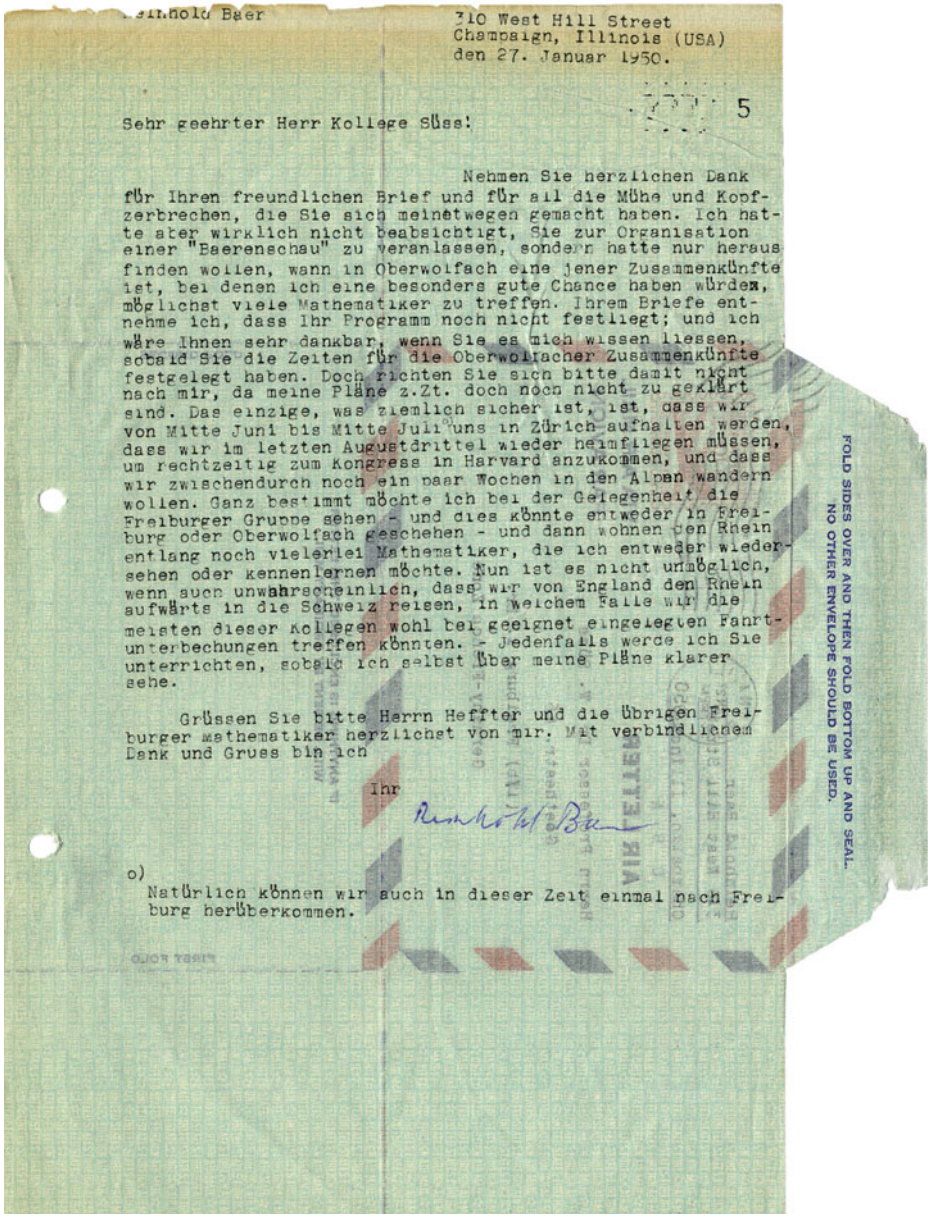
Süss was also interested in bringing Reinhold Baer, Friedrich Wilhelm Levi and Bernhard Neumann to the institute. Their reactions to his invitations were positive. Baer and Neumann would certainly have come to Oberwolfach as early as the late 1940s but for lack of travel funds. Levi came to Oberwolfach in 1950 and Baer in 1952 (not having managed to incorporate the visit into his 1950 travel plans). In 1951 Bernhard Neumann (1909-2002), who had emigrated to Great Britain in 1933,

"Logics meeting" 1949: from left Irmgard Süss, Hans-Heinrich Ostmann, Paul Bernays, Gisbert Hasenjäger, Arnold Schmidt, Herbert von Kaven, Kurt Schütte

came with his wife Hanna (1914-1971), a group theorist as well. For Baer and Levi, these early visits to Oberwolfach were important steps on their way back to Germany. Neumann organized his first conference on group theory at Oberwolfach in 1955. Baer frequently organized workshops at Oberwolfach in the 1950s and 1960s, beginning in 1954. Both Baer and Neumann were instrumental to the remigration of mathematical ideas and theories to Germany, in particular in group theory. The beginnings of Oberwolfach and Süss's role in the Nazi period were rarely discussed well into the 1990s. The corresponding documents kept at the Institute have only been accessible in a public archive since 1997. It is open to speculation what Jewish guests at Oberwolfach may have known and thought about the genesis of the institute and Süss's political activities during the Nazi period.

1950s: from right Bernhard Neumann, Marshall Hall, Hanna Neumann, Reinhold Baer

Letter from Reinhold Baer to Wilhelm Süss, 27 January 1950



...einhold Baer
710 West Hill Street
Champaign, Illinois (USA)
den 27. Januar 1950.

5

Sehr geehrter Herr Kollege Süss:

Nehmen Sie herzlichen Dank für Ihren freundlichen Brief und für all die Mühe und Kopfzerbrechen, die Sie sich meinetwegen gemacht haben. Ich hatte aber wirklich nicht beabsichtigt, Sie zur Organisation einer "Baerenschau" zu veranlassen, sondern hatte nur herausfinden wollen, wann in Oberwolfach eine jener Zusammenkünfte ist, bei denen ich eine besonders gute Chance haben würde, möglichst viele Mathematiker zu treffen. Ihrem Briefe entnehme ich, dass Ihr Programm noch nicht festliegt; und ich wäre Ihnen sehr dankbar, wenn Sie es mich wissen liessen, sobald Sie die Zeiten für die Oberwolfacher Zusammenkünfte festgelegt haben. Doch richten Sie sich bitte damit nicht nach mir, da meine Pläne z.Zt. doch noch nicht zu geklärt sind. Das einzige, was ziemlich sicher ist, ist, dass wir von Mitte Juni bis Mitte Juli uns in Zürich aufhalten werden, dass wir im letzten Augustdrittel wieder heimfliegen müssen, um rechtzeitig zum Kongress in Harvard anzukommen, und dass wir zwischendurch noch ein paar Wochen in den Alpen wandern wollen. Ganz bestimmt möchte ich bei der Gelegenheit die Freiburger Gruppe sehen - und dies könnte entweder in Freiburg oder Oberwolfach geschehen - und dann wohnen den Rhein entlang noch vielerlei Mathematiker, die ich entweder wiedersehen oder kennenlernen möchte. Nun ist es nicht unmöglich, wenn auch unwahrscheinlich, dass wir von England den Rhein aufwärts in die Schweiz reisen, in welchem Falle wir die meisten dieser Kollegen wohl bei geeignet eingelegten Fahrtunterbechungen treffen könnten. - Jedenfalls werde ich Sie unterrichten, sobald ich selbst über meine Pläne klarer sehe.

Grüssen Sie bitte Herrn Heffter und die übrigen Freiburger Mathematiker herzlichst von mir. Mit verbindlichem Dank und Gruss bin ich

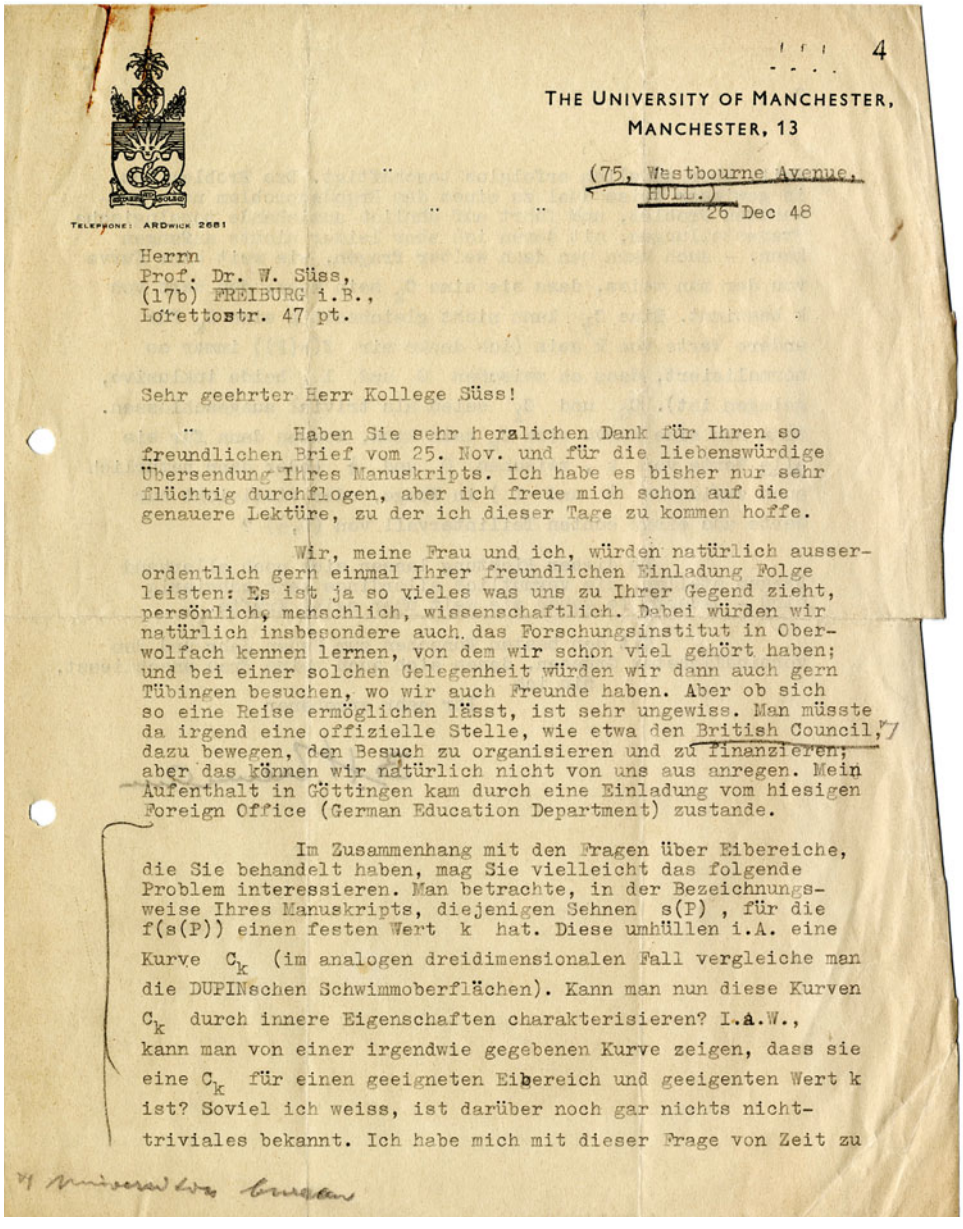
Ihr

Reinhold Baer

o)
Natürlich können wir auch in dieser Zeit einmal nach Freiburg herüberkommen.

FOLD SIDES OVER AND THEN FOLD BOTTOM UP AND SEAL.
NO OTHER ENVELOPE SHOULD BE USED.

Please accept my sincere gratitude for your amicable letter, and for all the trouble you have gone through on my behalf. But truthfully, I had not intended to induce you to organize a “bear show”, but had only wanted to find out the date of the next Oberwolfach meeting, at which I would have the best opportunity to meet as many mathematicians as possible. Your letter tells me that your program is not yet fixed; I would be very grateful if you could let me have the dates of the next Oberwolfach meetings, as soon as you have determined the agenda. But please, do not try to adapt these to my schedule, as this is still very much up in the air.



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THE UNIVERSITY OF MANCHESTER,
MANCHESTER, 13

(75, Westbourne Avenue,
HULL.)
26 Dec 48

TELEPHONE: ARDWICK 2681

Herrn
Prof. Dr. W. Süss,
(17b) FREIBURG i.B.,
Lorettostr. 47 pt.

Sehr geehrter Herr Kollege Süss!

Haben Sie sehr herzlichen Dank für Ihren so freundlichen Brief vom 25. Nov. und für die liebenswürdige Übersendung Ihres Manuskripts. Ich habe es bisher nur sehr flüchtig durchflogen, aber ich freue mich schon auf die genauere Lektüre, zu der ich dieser Tage zu kommen hoffe.

Wir, meine Frau und ich, würden natürlich ausserordentlich gern einmal Ihrer freundlichen Einladung Folge leisten: Es ist ja so vieles was uns zu Ihrer Gegend zieht, persönlich, menschlich, wissenschaftlich. Dabei würden wir natürlich insbesondere auch das Forschungsinstitut in Oberwolfach kennen lernen, von dem wir schon viel gehört haben; und bei einer solchen Gelegenheit würden wir dann auch gern Tübingen besuchen, wo wir auch Freunde haben. Aber ob sich so eine Reise ermöglichen lässt, ist sehr ungewiss. Man müsste da irgend eine offizielle Stelle, wie etwa den British Council, dazu bewegen, den Besuch zu organisieren und zu finanzieren; aber das können wir natürlich nicht von uns aus anregen. Mein Aufenthalt in Göttingen kam durch eine Einladung vom hiesigen Foreign Office (German Education Department) zustande.

Im Zusammenhang mit den Fragen über Eibereiche, die Sie behandelt haben, mag Sie vielleicht das folgende Problem interessieren. Man betrachte, in der Bezeichnungsweise Ihres Manuskripts, diejenigen Sehnen s(P) , für die f(s(P)) einen festen Wert k hat. Diese umhüllen i.A. eine Kurve C_k (im analogen dreidimensionalen Fall vergleiche man die DUPINschen Schwimmoberflächen). Kann man nun diese Kurven C_k durch innere Eigenschaften charakterisieren? I.A.W., kann man von einer irgendwie gegebenen Kurve zeigen, dass sie eine C_k für einen geeigneten Eibereich und geeigenten Wert k ist? Soviel ich weiss, ist darüber noch gar nichts nichttriviales bekannt. Ich habe mich mit dieser Frage von Zeit zu

Letter from Bernhard Neumann to Wilhelm Süss, 26 December 1948

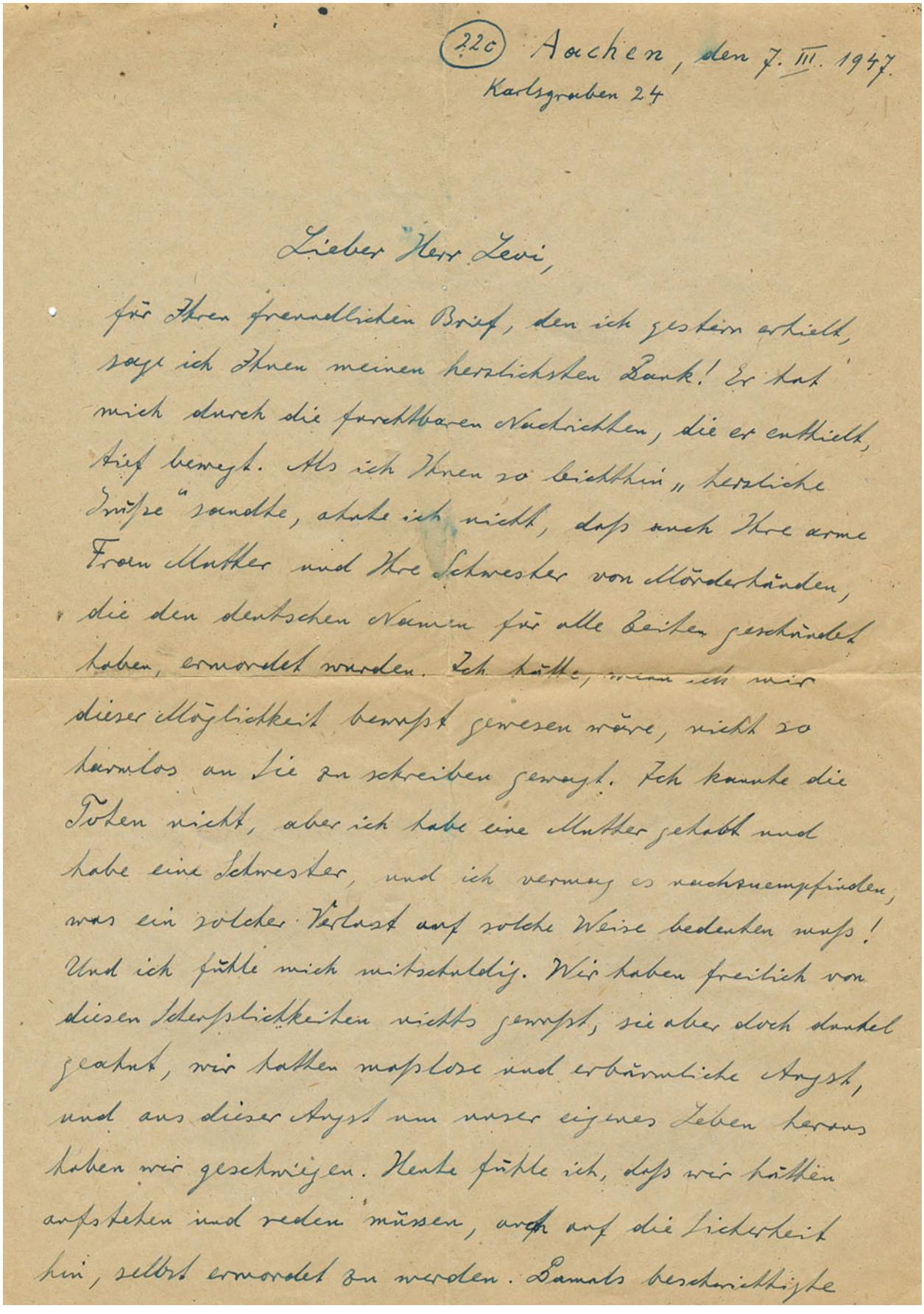
We, my wife and myself, would of course be most pleased to accept your friendly invitation: there is so much that attracts us to your region, personally, on a human level, scientifically. We would especially like to get to know the research institute at Oberwolfach, of which we have heard so much. And on the same occasion, we would also like to visit Tübingen, where we also have friends. But it is not yet sure at all whether such a trip can be made possible. It would be necessary to convince some authority, such as the British Council, to organize and finance the visit, but of course that is not something that we can initiate from our side. My stay in Göttingen was made possible by an invitation from the Foreign Office here (German Education Department).

Addressing the past

In post-war Germany, the Nazi past and especially the Holocaust were topics that were rarely addressed in public debate or in academic culture for many years. This silence stood between Germans and Jewish emigrants, many of whom could not envisage returning to Germany or even reestablishing connections in the face of the ignorant or indifferent stance of most German colleagues. The first steps were often very precarious.[12] An example of this is the correspondence between Friedrich Wilhelm Levi in India and Hubert Cremer in Germany. In March 1947, when Cremer learned from Levi's response to an innocuous letter of his that Levi's mother and sister had, as Cremer put it, "been murdered by the villainous hands that have forever defiled the name of Germany", he did not shy away, as happened so often. Instead, he openly addressed the issue of his own guilt – "And I feel guilty" – and thanked Levi "that after such atrocities you have not transferred your ever so justified feelings of hatred to me but have even written such a friendly letter".[13]

12 See the study by (Deichmann 2001: chapter 8).

13 Hubert Cremer to Friedrich Wilhelm Levi, 7 March 1947 (Universitätsbibliothek Freiburg).



(220) Aachen, den 7. III. 1947.
Karlsgraben 24

Lieber Herr Levi,

für Ihren freundlichen Brief, den ich gestern erhielt, sage ich Ihnen meinen herzlichsten Dank! Er hat mich durch die furchtbaren Nachrichten, die er enthielt, tief bewegt. Als ich Ihnen so leichthin „herzliche Grüße" sandte, ahnte ich nicht, daß auch Ihre arme Frau Mutter und Ihre Schwester von Mörderhänden, die den deutschen Namen für alle Zeiten geschändet haben, ermordet worden. Ich hätte, wenn ich mir dieser Möglichkeit bewußt gewesen wäre, nicht so harmlos an Sie zu schreiben gewagt. Ich kannte die Toten nicht, aber ich habe eine Mutter gehabt und habe eine Schwester, und ich vermag es nachzuempfinden, was ein solcher Verlust auf solche Weise bedeuten muß! Und ich fühle mich mitschuldig. Wir haben freilich von diesen Scheußlichkeiten nichts gewußt, sie aber doch dunkel geahnt, wir hatten maßlose und erbärmliche Angst, und aus dieser Angst um unser eigenes Leben heraus haben wir geschwiegen. Heute fühle ich, daß wir hätten aufstehen und reden müssen, auch auf die Gefahr hin, selbst ermordet zu werden. Damals beschränkte

Letter from Hubert Cremer to Friedrich Wilhelm Levi, 7 March 1947

ich mein Gewissen mit dem armseligen Einwand, daß ein solches Opfer ja sinnlos wäre, und mit ~~der~~ heimlichen Geldspenden an in Not geratene Juden, auch das immer nur in ständiger Angst, daß das herauskommen und mich auch ins K. L. bringen könnte!

Es ist nicht die erste schreckliche Nachricht, die ich erhalte. Auch Mutter, Schwester, Schwager und Schwiegereltern meines Freundes Alfred Brauer wurden ermordet, und ich kenne ja auch die Zahl der Ermordeten, aber es ist jedesmal wieder ein neuer Schlag, wenn ich im Einzelfalle wieder bestätigt finde, was mir immer noch nicht faßbar ist. Darf ich Ihnen und Ihrer Gattin wenigstens meine aufrichtigste Anteilnahme an diesem furchtbaren Geschehen, das mich tief bedrückt, zum Ausdruck bringen? Und darf ich Ihnen danken, daß Sie die nach solchen Scheußlichkeiten nur zu berechtigten Haßgefühle nicht auf mich übertragen, mir vielmehr einen so herzlichen Brief geschrieben haben! Es hat mir sehr wohl getan.

In aufrichtiger Anteilnahme bin ich

Ihr

Hubert Cremer

Aachen, 7 March 1947
Karlsgraben 24

Dear Mr. Levi,

I would like to express my heartfelt gratitude for your friendly letter, which I received yesterday! I was deeply moved by the horrible news it included. When I airily sent you my best wishes, I had no idea that your poor mother and your sister had also been murdered by the villainous hands that have forever defiled the name of Germany. If I had been aware of this possibility, I would probably not have dared to write to you so innocuously. I did not know the deceased, but I did have a mother, and I do have a sister, and I am able to imagine what it must feel like to have lost so much, and in such a way! And I feel guilty. Of course, we were not aware of these atrocities, but we did have dark suspicions. We were excessively and pathetically afraid, and this fear for our own lives induced us to be silent. Today I feel that we should have stood up and talked, even though this would most certainly have meant being killed as well. At the time, I pacified my conscience with the miserable objection that such a sacrifice would be senseless, and I secretly donated money to impoverished Jews, all the time afraid that this might become known and I would myself be sent to a concentration camp.

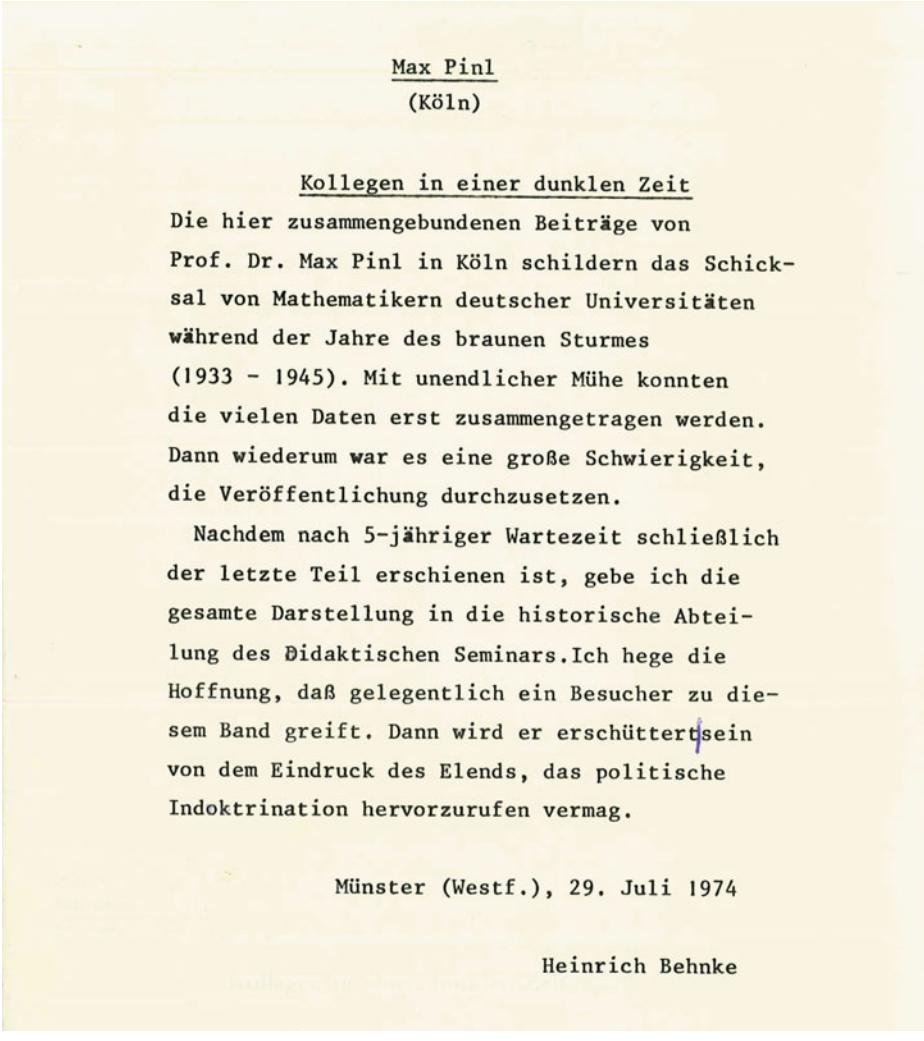
This is not the first time that I have received horrible news. The mother, sister, brother-in-law and parents-in-law of my friend Alfred Brauer were also murdered, and of course I know how many were murdered, but every time it is once again a blow to have the confirmation in individual cases that that which remains so unfathomable has once again occurred. May I at least express my heartfelt sympathy to you and your wife for these abominable losses, which aggrieve me deeply. And may I express my gratitude that after such atrocities you have not transferred your ever so justified feelings of hatred to me but have even written such a friendly letter! It has done me a lot of good.

With heartfelt sympathy
Yours,
Hubert Cremer

However, like a majority of Germans, most mathematicians in Germany, for more than three decades, remained generally reluctant to engage with the history of the Nazi period. A notable exception was Maximilian (Max) Pinl (1897-1978), who since 1945 had been collecting data on mathematicians who had been dismissed or were forced to emigrate. He was the first to fully realize and state clearly how many mathematicians had been forced out of the profession with the deceptive labels "Withdrawal of the *venia legendi*", "Dismissal", "Removal from office" or "Retirement". When in the mid-1960s he wanted to publish his results in *Jahresbericht der DMV*, the perhaps most appropriate place, he had to face the opposition of the DMV board. Heinrich Behnke threw his full professional weight behind him to help overcome this resistance, but Pinl's series of four articles "Kollegen in einer dunklen Zeit" was not published until 1969 to 1974, the last instalment once again meeting heavy opposition.[14]

14 Preface by Heinrich Behnke to the bound copy of Maximilian Pinl's series of articles "Kollegen in einer dunklen Zeit" (Münster, Bibliothek des Mathematischen Instituts der Universität Münster). On this also see (Butzer; Volkmann 2006: 6).

Preface by Heinrich Behnke to the bound copy of Maximilian Pinl's series of articles "Kollegen in einer dunklen Zeit"



Max Pinl
(Köln)

Kollegen in einer dunklen Zeit

Die hier zusammengebundenen Beiträge von Prof. Dr. Max Pinl in Köln schildern das Schicksal von Mathematikern deutscher Universitäten während der Jahre des braunen Sturmes (1933 - 1945). Mit unendlicher Mühe konnten die vielen Daten erst zusammengetragen werden. Dann wiederum war es eine große Schwierigkeit, die Veröffentlichung durchzusetzen.

Nachdem nach 5-jähriger Wartezeit schließlich der letzte Teil erschienen ist, gebe ich die gesamte Darstellung in die historische Abteilung des Didaktischen Seminars. Ich hege die Hoffnung, daß gelegentlich ein Besucher zu diesem Band greift. Dann wird er erschüttert sein von dem Eindruck des Elends, das politische Indoktrination hervorzurufen vermag.

Münster (Westf.), 29. Juli 1974

Heinrich Behnke

Max Pinl
(Cologne)

Colleagues in the Years of Darkness

The articles collected here, contributed by Dr. Max Pinl from Cologne, describe the fates of mathematicians working at German universities during the years of the Brown Storm (1933 – 1945). This great body of data has been compiled with endless effort, and the compilation work was followed by great difficulties in having it published.

After a waiting period of five years the last part has finally been published, so that I can now place the entire collection in the care of the historical section of the Didactic Seminar.

I cherish the hope that from time to time a visitor will pick up this volume. He will then be appalled at the impression of the misery brought about by political indoctrination.

Münster (Westphalia), 29 July 1974

Heinrich Behnke

Maximilian Pinl/Lux Furtmüller: Mathematicians under Hitler. *Leo Baeck Institute Yearbook* 18 (1973), 129–182

Mathematicians under Hitler

BY MAX PINL AND LUX FURTMÜLLER

"A whole generation has passed since the horsemen of the apocalypse rode over vast tracts of the globe, and it would seem that the time has come at last to look back to the break that occurred in the development of German mathematical science during the years 1933–1945 and to remember the colleagues of those years of darkness whose innocent victims they were."

Thus Professor Pinl in his introduction to his four-part report on mathematicians who suffered persecution under Hitler.[1] Professor Pinl's report is addressed to the younger generation of German mathematicians; he analyses the mathematical achievements of his victimised colleagues at some length; he lists them according to the universities where they were last active; also he refers for further biographical details to publications readily obtainable at libraries of German university departments of mathematics but not so easily accessible elsewhere.

This present version, written by the second author, leaves out all the bibliographies and most of the mathematical detail presented by Pinl, while drawing on additional sources, mostly those given in Pinl's report,[2] to expand on points of human, political and historical interest. This study consists of a general introduction presenting an overall picture (Part I), followed by alphabetical lists of 127 brief biographies of mathematicians who were victimised or fell foul of the regime; 101 of these are Jews or of Jewish descent. Victimisation in Nazi Germany, of course, did not stop at individuals of Jewish descent, and so we shall meet a number of "Aryan" mathematicians who for reasons of circumstance, conviction or character were incompatible with the Nazi regime. The reasons for such incompatibility illuminate some aspects of academic life, and life in general, under the Third Reich.

This study is a kind of pioneer work, taking one group of scholars and tracing their expulsion by the Nazi authorities and their subsequent fate. As such, this inquiry may be regarded as symptomatic and representative, recreating the atmosphere which surrounded Jewish scholars in Germany after 1933. Similar surveys could be suggested for other branches of science.

[1]M. Pinl, 'Kollegen in einer dunklen Zeit', *Jber. DMV* (*Jahresbericht der Deutschen Mathematiker-Vereinigung*) 71, 167–228, 1969; 72, 165–189, 1971; 73, 153–208, 1972; Part IV, dealing with the Austrian universities and the German university in Prague (by Auguste Dick and Max Pinl) is yet to be published, though it appears now unlikely that it will be issued in Germany; the four parts to be quoted here as Pinl I–IV. An attribution such as "according to Pinl" refers to a personal communication from Prof. Pinl, whereas "according to Pinl (I)" refers to the appropriate part of Pinl's report, usually without page number (as Pinl's material is systematically organised); page numbers are also mostly omitted in references to books with serviceable indexes.

[2]Such sources will be identified by the author's name and the note "ref. Pinl I", etc.

Together with Lux Furtmüller, Pinl published a summary report in the 1973 *Leo Baeck Institute Yearbook*, thus providing the first overview of the various stations of exile and the range of career paths taken by the 127 mathematicians (five of whom were women) driven out of Germany after 1933.[15] For the most part, mathematics has remained a white spot on the map of Jewish remigration.[16] Also, substantial further historical research will be necessary in order to chart the landscape of Jewish émigré mathematicians and their relations to post-war Germany. Indeed, in assessing and understanding the complexity of the impact of Jewish mathematicians in Germany and their fate, mathematicians and historians have only just taken the first steps, and much remains to be done.

Volker R. Remmert

15 (Pinl; Furtmüller 1973).
16 See (Krauss 2004: 107).

Most German-Jewish mathematicians whose story is told in this exhibition were able to save their lives.

Others were killed by the Nazis or committed suicide. This exhibition is dedicated to their memory.

In Memoriam

LUDWIG BERWALD
OTTO BLUMENTHAL
PAUL EPSTEIN
WALTER FRÖHLICH
KURT GRELLING

FRITZ HARTOGS
FELIX HAUSDORFF
CHARLOTTE HURWITZ
MARGARETE KAHN
PAUL LONNERSTÄDTER

NELLI NEUMANN
GEORG PICK
ROBERT REMAK
REINHOLD STRASSMANN
ALFRED TAUBER

and all those whose names are not mentioned here

B. Bergmann et al. (eds.), *Transcending Tradition*

Archival Holdings on Jewish Mathematicians in Germany

In preparation for the exhibition, we wrote to the archives of the German universities where the Jewish mathematicians listed in Chapter 2 had been active. Nearly all of the archives contacted proved to be very helpful and obligingly provided information about materials available on Jewish mathematicians. The holdings of the archives are listed as reported to us. Naturally, it can be assumed that additional, smaller holdings might be found in other literary estates or at other locations. Since nearly all archival documents listed here are written and catalogued in German, we have left the following descriptions of archival material untranslated.

The University of Göttingen has comprehensive holdings. We compiled an inventory using the digital access system "Spezialinventar zur Geschichte der Mathematik und Naturwissenschaften der Universität 1880-1933" [Special inventory on the history of mathematics and natural sciences of the University 1880-1933], which can be viewed on the website of the university archives at Göttingen. The literary estates of other Göttingen mathematicians, for example those of Felix Klein and David Hilbert, also contain material on Jewish mathematicians, some of it quite extensive. Unfortunately, such holdings could not be included here. Similarly, the literary estates of mathematicians who emigrated, as well as archive inventories outside Germany, do not appear here. We would be happy to receive any additional information about material in other archives or in private hands.

We wish to express our gratitude to all the archives contacted for their friendly assistance.

Reinhold Baer
Universität Freiburg, Universitätsarchiv: Personalakte und dienstliche Korrespondenz. Universität Halle-Wittenberg, Universitätsarchiv: Personalakte von 1928-1933, Entlassungsschreiben vom September 1933, Postkarte an die Quästur, Fragebogen zum Gesetz zur Wiederherstellung des Berufsbeamtentums

Paul Bernays
Universität Göttingen, Universitätsarchiv: Personalakte mit Unterlagen zum Entzug der Lehrbefugnis 1933 und zum Wiedergutmachungsverfahren

Felix Bernstein
Universität Göttingen, Universitätsarchiv: Personalakte mit Ablehnung des Antrags auf Beförderung zum Ordinarius, Empfehlungsschreiben Courants, Hilberts und Runges für Bernstein, Übertragung eines persönlichen Ordinariats 1921, Schriftstücke zum anhaltenden Protest der Fakultätsmehrheit gegen Bernstein; Universitätsbibliothek: Nachlass Felix Bernstein.
Universität Halle-Wittenberg, Universitätsarchiv: Habilitationsakte, Abgangszeugnis, Gutachten

Otto Blumenthal
Universität Aachen, Universitätsarchiv: Schriftstücke die Entlassung Blumenthals betreffend, Empfehlungsschreiben und Stellungnahmen von Kollegen zu Blumenthals Entlassung, Meldung zu Blumenthals Tod in Theresienstadt

Stefan Bergmann
Universität Berlin, Universitätsarchiv: Promotionsakte, Habilitationsakte

Salomon Bochner
Universität München, Universitätsarchiv: Zulassung als Privatdozent, Habilitationsgesuch, diverse Sonderdrucke und ein Abiturzeugnis

Carl Wilhelm Borchardt
Universität Berlin, Universitätsarchiv: Promotionsakte, Sitzungsprotokolle und Berufungsunterlagen

Alfred Theodor Brauer
Universität Berlin, Universitätsarchiv: Personalakte, Promotionsakte, Habilitationsakte, Fotografie

Samson Breuer
Technische Universität Karlsruhe, Universitätsarchiv: Unterlagen zum Wiedergutmachungsverfahren von 1956

Stefan Cohn-Vossen
Universität Göttingen, Universitätsarchiv: Personalakte.
Universität Köln, Universitätsarchiv: Personalakte

Richard Courant
Universität Göttingen, Universitätsarchiv: Personalakte mit Einträgen zu einer Verleumdungskampagne gegen Courant aus den Jahren 1926/27, Beurlaubung Courants 1933, Einträge zum Wiedergutmachungsverfahren.
Universität Münster, Universitätsarchiv: Personalakte, dienstliche Korrespondenz, Urkunden

Max Dehn
Universität Münster, Universitätsarchiv: Personalakte, Promotionsurkunde, Verleihung Professorentitels.
Universität Frankfurt, Universitätsarchiv: Personalakten, dienstliche Korrespondenz, gesammelte Presseartikel

Ferdinand Gotthold Eisenstein
Universität Berlin, Universitätsarchiv: Sitzungsprotokolle und Berufungsunterlagen

Paul Epstein
Universität Frankfurt, Universitätsarchiv: Personalakten, dienstliche Korrespondenz, gesammelte Presseartikel

Willy Feller
Kiel, Landesarchiv Schleswig-Holstein: Unterlagen zum Wiedergutmachungsverfahren

Abraham A. Fraenkel
Kiel, Landesarchiv Schleswig-Holstein: Personalakte, Unterlagen zu den Wiedergutmachungs- und Entschädigungsverfahren

Immanuel Lazarus Fuchs
Universität Berlin, Universitätsarchiv: Personalakte, Sitzungsprotokolle und Berufungsunterlagen, Fotografie.
Universität Greifswald; Universitätsarchiv: Personalakte, „Labores" (handschriftliche Aufstellungen der abgehaltenen Lehrveranstaltungen Greifswalder Professoren), Berufungsunterlagen.
Universität Heidelberg, Universitätsarchiv: Personalakte, dienstliche Korrespondenz, Fotografie; Universitätsbibliothek: Briefe

Emil Julius Gumbel
Universität Heidelberg, Universitätsarchiv: Personalakte, dienstliche Korrespondenz darunter Unterlagen zum Disziplinarverfahren von 1924 und Entzug der Lehrbefugnis, Fotografie; Universitätsbibliothek: Briefe

Sigmund Gundelfinger
Universität Tübingen, Universitätsarchiv: Personalakten dienstliche Korrespondenz; Universitätsbibliothek: Fotografie und Hörerverzeichnisse von 1869-1879; Bibliothek des Mathematischen Instituts: Protokollbuch mit Einträgen von Gundelfinger

Hans Hamburger
Universität Berlin, Universitätsarchiv: Personalakte, Habilitationsakte, Sitzungsprotokolle und Berufungsunterlagen.
Universität Köln, Universitätsarchiv: Personalakte, Beurlaubungsschreiben aus dem Jahr 1935

Friedrich Hartogs
Universität München, Universitätsarchiv: Habilitationsgesuch, Personalakte mit Habilitationsverfahren, Umwandlung der Professur in ein Extraordinariat für Statistik

Felix Hausdorff
Universität Bonn, Universitätsarchiv (Nachlassteile): Materialien zur Leipziger Antrittsvorlesung, Entwürfe und Notizen zur Rezension eines Artikels von Edmund Landau, Druckbögen, Briefe, Adresslisten, Sonderdrucke, Vorlesungsmitschriften, eine schlechte Kopie seines Abschiedsbriefes, Einladungskarte zu einer Antrittsvorlesung; Universitäts- und Landesbibliothek: Sehr umfangreicher Nachlass.
Universität Greifswald, Universitätsarchiv: Die Personalakte von Felix Hausdorff wurde am 4.12.1935 nach Bonn übersandt, Versetzungsschreiben.
Universität Leipzig, Universitätsarchiv: Personalakte

Ernst Hellinger
Universität Frankfurt, Universitätsarchiv: Personalakten, dienstliche Korrespondenz, gesammelte Presseartikel

Emil Hilb
Universität Erlangen, Universitätsarchiv: Personalakte, Habilitationsakte

Heinz Hopf
Eidgenössische Technische Hochschule Zürich, Archiv der ETH: Nachlass

Ludwig Hopf
Universität Aachen, Universitätsarchiv: Die ursprünglichen Personalakten zu Hopf sind im Oktober 1946 vernichtet worden. Es existieren einzelne dienstliche Schriftstücke im Universitätsarchiv sowie die Unterlagen betreffend der Versorgungsansprüche von Hopfs Witwe.

Adolf Hurwitz
Universität Göttingen, Universitätsarchiv: Personalakte

Carl Gustav Jacob Jacobi
Universität Berlin, Universitätsarchiv: Habilitationsakte, Sitzungsprotokolle und Berufungsunterlagen, Nachruf, Vorlesungsmanuskript (Vorlesung über analytische Mechanik).
Universität Tübingen, Bibliothek des Mathematischen Instituts: Aus dem Besitz der Familie Gundelfinger befinden sich einige ausgearbeitete Vorlesungen von C.G.J. Jacobi im Bestand der Institutsbibliothek.

Theodore von Kármán
Universität Göttingen, Universitätsarchiv: Personalakte mit Lebenslauf, Gutachten und Publikationsverzeichnis

Leo Königsberger
Universität Dresden, Universitätsarchiv: Fotografien.
Hauptstaatsarchiv Dresden: dienstliche Korrespondenz.
Universität Greifswald, Universitätsarchiv: Personalakte, „Labores" (handschriftliche Aufstellungen der abgehaltenen Lehrveranstaltungen Greifswalder Professoren), Berufungsunterlagen.
Universität Heidelberg, Universitätsarchiv: dienstliche Korrespondenz, Fotografien; Universitätsbibliothek: Briefe

Leopold Kronecker
Universität Berlin, Universitätsarchiv: Personalakte, Promotionsakte, Berufungsunterlagen, Fotografie

Edmund Landau
Universität Berlin, Universitätsarchiv: Promotionsakte, Habilitationsakte, Sitzungsprotokolle und Berufungsunterlagen.
Universität Göttingen, Universitätsarchiv: Personalakte mit Entzug der Lehrbefugnis 1933, Unterlagen zu studentischen Boykottmaßnahmen, und zur Wiedergutmachung

Georg Landsberg
Universität Heidelberg, Universitätsarchiv: Personalakte, Fotografie

Friedrich Wilhelm Levi
Universität Leipzig, Universitätsarchiv: Personalakte
Universität Freiburg: Archiv der geologischen Vereinigung

Hans Lewy
Universität Göttingen, Universitätsarchiv: Personalakte, Bitte um Beurlaubung wegen unerträglicher Haltung einiger Studenten 1933, Entzug der Lehrbefugnis 1933

Leon Lichtenstein
Universität Leipzig, Universitätsarchiv: Personalakte.
Universität Münster, Universitätsarchiv: Personalakten, Urkunden, dienstliche Korrespondenz

Karl Otto Heinrich Liebmann
Universität Heidelberg, Universitätsarchiv: Personalakte, Fotografien; Universitätsbibliothek: Briefe.
Universität Leipzig, Universitätsarchiv: Personalakte.
Technische Universität München, Universitätsarchiv: Personalakte und dienstliche Korrespondenz

Alfred Loewy
Universität Freiburg, Universitätsarchiv: Personalakte und dienstliche Korrespondenz

Franz London
Universität Bonn, Universitätsarchiv (Nachlassteil)e: Vorlesungsmitschriften und Präparationsnotizen, Personalakte, Fotografie; Universitäts- und Landesbibliothek: Nachlass

Hermann Minkowski
Universität Bonn, Universitätsarchiv: Personalakte, Doktorurkunde.
Universität Göttingen, Universitätsarchiv: Personalakte

Richard von Mises
Universität Berlin, Universitätsarchiv: Personalakte, Sitzungsprotokolle und Berufungsunterlagen, Universitätsrede.
Universität Dresden, Universitätsarchiv: Briefe an Trefftz Übergabe der Schriftleitung der GAMM betreffend.
Hauptstaatsarchiv Dresden: dienstliche Korrespondenz

Emmy Noether
Universität Erlangen, Universitätsarchiv: Matrikeleintrag, Promotionsakte, Fotografie.
Universität Göttingen, Universitätsarchiv: Personalakte mit Ablehnung der Zulassung zur Habilitation von 1917, Gutachten, Antrag auf Ernennung zur nichtbeamteten außerordentlichen Professorin von 1922

Max Noether
Universität Erlangen, Universitätsarchiv: neben der Personal- und Berufungsakte findet sich im Universitätsarchiv außerdem ein Eintrag von M. Noether in das sogenannte Goldene Buch der Universität, sowie einige Briefe an Elias von Steinmeyer und Fotografien.
Universität Heidelberg, Universitätsarchiv: Personalakte, dienstliche Korrespondenz, Fotografie

Alexander Ostrowski
Universität Göttingen, Universitätsarchiv: Personalakte

Moritz Pasch
Universität Gießen, Universitätsarchiv: Personalakte, Fotografie, Nachlassteile: Vorlesungsmanuskripte, Abhandlungen, Sonderdrucke; Universitätsbibliothek: Briefe

Felix Pollaczek
Universität Berlin, Universitätsarchiv: Promotionsakte

Hilda Pollaczek-Geiringer
Universität Berlin, Universitätsarchiv: Personalakte, Promotionsakte

Wilhelm Prager
Universität Göttingen, Universitätsarchiv: Personalakte mit Einträgen zu Ermittlungen über Pragers jüdische Vorfahren sowie seine politische Einstellung, studentische Protestaktionen gegen Prager, Entzug der Lehrbefugnis 1933

Alfred Pringsheim
Universität München, Universitätsarchiv: Personalakte, Schriftverkehr zur Nachfolge Pringsheim, Bericht über Belästigung des Ehepaares Pringsheim auf der Straße 1883

Robert Remak
Universität Berlin, Universitätsarchiv: Promotionsakte, Habilitationsakte, Fotografie

Arthur Rosenthal
Universität Heidelberg, Universitätsarchiv: Personalakte, Fotografien.
Universität München, Universitätsarchiv: Personalakte mit Habilitationsgesuch und -verfahren

Hermann Schapira
Universität Heidelberg, Universitätsarchiv: Personalakte, dienstliche Korrespondenz, Fotografie

Ludwig Schlesinger
Universität Bonn, Universitätsarchiv: Personalakte.
Universität Gießen, Universitätsarchiv: Personalakte, Fotografie; Universitätsbibliothek: Briefe

Arthur Schönflies
Universität Frankfurt, Universitätsarchiv: Personalakten, dienstliche Korrespondenz, gesammelte Presseartikel, Fotografie.
Universität Göttingen, Universitätsarchiv: Personalakte

Issai Schur
Universität Berlin, Universitätsarchiv: Personalakte, Promotionsakte, Habilitationsakte, Sitzungsprotokolle und Berufungsunterlagen.
Universität Bonn, Universitätsarchiv: Personalakte

Karl Schwarzschild
Universität Göttingen, Universitätsarchiv: Personalakte; Universitätsbibliothek: Nachlass.
Universität München, Universitätsarchiv: Personalakte mit Habilitationsverfahren

Moritz Abraham Stern
Universität Göttingen, Universitätsarchiv: Personalakte

Wolfgang Sternberg
Universität Heidelberg, Universitätsarchiv: Personalakte

Otto Szász
Universität Frankfurt, Universitätsarchiv: Personalakten, dienstliche Korrespondenz, gesammelte Presseartikel

Gábor Szegö
Universität Berlin, Universitätsarchiv: Habilitationsakte, Sitzungsprotokolle und Berufungsunterlagen

Otto Toeplitz
Universität Bonn, Universitätsarchiv (Nachlassteile): hauptsächlich Vorlesungsmitschriften (auch von Julius und Emil Toeplitz); Universitäts- und Landesbibliothek: Nachlass.
Universität Göttingen, Universitätsarchiv: Personalakte

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