Max-Planck-Institut für Mathematik
Historical Notes on the New Research Institute at Bonn

Norbert Schappacher

Ich beginne weit vor mir; denn niemand sollte sein Leben beschreiben, der nicht die Geduld aufbringt, vor dem Datieren der eigenen Existenz wenigstens der Hälfte seiner Großeltern zu gedenken.

Günter Grass, *Die Blechtrommel*

It seems wise to follow this advice with respect to the young Max-Planck-Institut für Mathematik (MPI) at Bonn: not to start describing its own short existence before saying something about at least half of its grandparents. The MPI began to exist "on paper" in 1981, and was established as a building on January 20, 1982. Thus, a mere description of its three-year existence cannot bring out its roots and perspectives. Let us begin instead by looking at the most famous (and strong-going) grandparent.

The Institute

In October 1933, Hermann Weyl finally decided to leave Göttingen to accept a chair at the Institute for Advanced Study (IAS) in Princeton. He was disgusted with the new Nazi government which went against his democratic ideas (he had lived in Switzerland for 17 years), potentially threatened his Jewish wife (and children), and had within the space of one summer managed to destroy almost completely what had been *the* mathematical centre of the world: the *Mathematisches Institut* at Göttingen. Weyl wrote to the ministry in Berlin: ". . . While the universities in Germany are now undergoing fundamental changes, I am happy to join a research institute whose foundation was not little inspired by the precept of the traditional German university."[1]

This seemed to me a puzzling statement when I first read it, as I had always considered the unity of *teaching and research* to be one of the most important features of the "traditional German university." In fact, Weyl himself, in his postwar reflections on "Universities and Science in Germany,"[2] made it the first attribute in his description of the German university as it used to be. What is more, at Göttingen Weyl had been especially popular among the students, and a student petition seems to have been decisive in his earlier refusal, at the end of 1932, to go to Princeton.[3] Abraham Flexner, the founder of the IAS and author of a report on European universities, had stopped over in Göttingen in the summer of 1932, and explained his scheme for the Institute to Weyl.[4] But only after the political turnover of 1933 did the attraction of an independent IAS abroad win out over the politically dominated university department of Göttingen.

Weyl certainly never regretted his decision to join the IAS.[5] But maybe his influence is reflected in some of the developments of the IAS during the thirties. For example, while Flexner's original vision of the institute was based on the idea of lonely intellectual heroes working away in splendid isolation, the School of Mathematics at the IAS soon began to invite young, promising scholars whose reputations (and job situations) were not as well established as those of the permanent members (so that inviting them carried a certain risk). In this respect—and in many others—the

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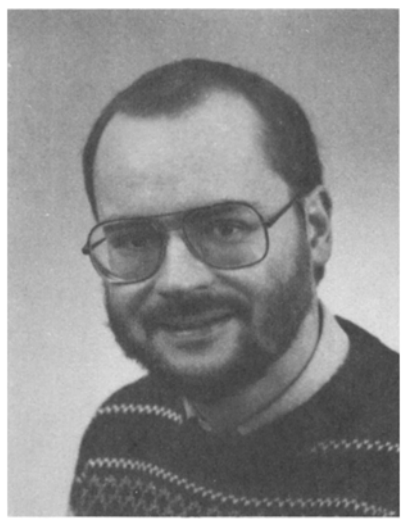


Hermann Weyl (left); and **Friedrich Hirzebruch** (1959)

IAS set the standard for what is usually seen today as the right way to stimulate mathematical research.

Friedrich Hirzebruch was one of those young mathematicians who profited from an invitation to the IAS. His first stay there, 1952–54, left him with the idea that Germany, too, should have a centre for mathematical research, beyond the various university departments. But this idea took a long time to materialize on a large scale. At first only small steps could be taken.

Beginnings of the *Arbeitstagung*

"When I came to Bonn in 1956, Professor Peschl suggested I should apply for funds from the ministry to organize small conferences. When I expressed this wish while negotiating with the ministry on the occasion of an offer from another university, the answer was 'of course, Herr Professor,' and the money was granted. I then wanted to organize a meeting every year, with as little administrative work and preparation as possible. Thus the idea arose . . . to let the program be decided by the participants as the conference went on. This proved very useful because in this way the most recent results could be presented."[6]

This is how Hirzebruch recalls the beginnings of the Bonn *Mathematische Arbeitstagung*. The first *Tagung* was held in 1957 with Atiyah, Grauert, Grothendieck, Kuiper and Tits as invited participants. The ministry gave a subsidy of 1000 DM. This contribution slowly grew over the years. At the 1962 *Arbeitstagung*, for example, Hirzebruch still personally distributed 5000 DM among the 22 participants eligible for financial support, and collected their signature on the receipts. The direct state subsidy to the *Arbeitstagung* finally remained constant at the sum of 6000 DM. But then, as we shall see, there were other ways to finance the ever-growing yearly meeting. In 1983, for example, the state subsidy represented roughly one sixth of the total expenses.

In 1957, the big *Arbeitstagung* we know today was in no way anticipated. At the meetings, the subjects were still fairly close to Hirzebruch's own research interests, not nearly as varied as they are today, and the same participants might well have gathered by accident at the IAS. In Bonn, however, they were meeting for only a week; inviting mathematicians for longer stays was not yet possible (except for occasional visiting positions that Hirzebruch managed to obtain.[7])

The situation was not to change for some time, although a flurry of activity, with a view to promoting mathematical research, was going on in Germany at the end of the fifties. To understand this we have to go back several years and—leaving Bonn for a moment—focus on a lonely mansion above the small village of Oberwolfach in the Black Forest, where Wilhelm Süss was already having definite ideas about a

German research institute in mathematics while Hirzebruch was still a student at Münster.

Oberwolfach and EUROMAT

Wilhelm Süss (1895–1958) appears to have been uniquely talented in efficiently promoting the cause of German mathematicians during World War II. Although he was probably not well-liked by parts of the Hitler administration, he was tremendously popular among his colleagues. During the war he was president of the DMV (*Deutsche Mathematiker-Vereinigung*—German Mathematical Society), rector of the Freiburg University, and president of the *Rektorenkonferenz* (assembly of all the rectors of German universities). Thus he got to know Bernhard Rust, Hitler's minister of education, and apparently became very friendly with him. But Rust had already taken to alcohol by this time, and was losing more and more real power as special agencies for all kinds of things were being created, restricting the competencies of the traditional ministries. So it was much more important for Süss to have the support of Ministerialdirektor Mentzel and Werner Osenberg. Mentzel, an old Nazi from Göttingen who had soon become a high official in Rust's ministry, was president of *Deutsche Forschungsgemeinschaft* (DFG, see below), and was directly involved with the wartime organization of scientific research. Osenberg was the instigator and principal organizer of the so-called *Osenberg-Aktion*, which got engineers and scientists off the battlefield to do research supposedly relevant to the war: *kriegswichtig*.

In the fall of 1942, Süss managed to obtain financial support for the publication of *kriegswichtige* mathematical literature, but he was already thinking in terms of a national mathematical research institute. When an offer from Göttingen was shaping up in the spring of 1944, officials in Southwest Germany (Baden) were alarmed by the prospect of the influential Süss leaving their region. This sped matters up considerably, and as of September 1, 1944, the new institute was able to begin functioning in the *Lorenzenhof* near Oberwolfach.[8]

In its first year the institute served primarily as a home for a small group of working mathematicians (among them Behnke, Seifert and Threlfall). And as it continued to exist, it gradually turned into a mathematical conference centre. Part of Süss's conception of the institute seems to have been that of a mathematical document centre. But in the first place, he was thinking of a research institute with four permanent members and a number of visitors. In a letter to the *Bundeskanzleramt* in Bonn, dated July 6, 1954, Süss mentioned as his final goal to get his institute under the roof of the *Max-Planck-Gesellschaft* (MPG, cf. next section).[9] But he died on May 29, 1958, before any concrete steps were taken.

After Süss's death, Hellmuth Kneser (Tübingen) took action to secure the further existence of Oberwolfach, especially with the Ministry of Culture of the Land of Baden-Württemberg, and he asked Hirzebruch to find out about the willingness of the federal ministry of the interior to provide help.

At the same time things were moving on the European scene: the European union for the peaceful use of nuclear technology, EURATOM, had been founded in March of 1957. Soon afterwards, a group of European mathematicians tried to find out about the possibilities of creating a European mathematical institute (to be called EUROMAT) within the EURATOM organization, or within a whole European university sponsored by EURATOM. Hirzebruch and H. Kneser were among the nine mathematicians who gathered in Brussels in April 1958 to pass a *Projet de création d'un institut européen de recherches mathématiques dans le cadre de l'EURATOM*. However, this project never came close to realization.

Slightly after this project, on July 4, 1958, the *Institut des hautes études scientifiques* (IHES), a French version of the IAS, was founded (on paper; the territory at Bures-sur-Yvette was purchased later), with financial support from nine French companies as well as FIAT (Italy) and EURATOM.

Then, still in July 1958, Hirzebruch perceived a certain interest on the part of the federal ministry of the interior to do something for mathematical research. Thus—also under the influence of the foundation of

Wilhelm Süss (1957)

IHES—he remembered essential features of the EUROMAT project, and quickly drafted an analogous proposal to turn Oberwolfach into an IAS-like German mathematical research institute with ten to twenty positions for visiting professors, and a small number of directors who were to be replaced every few years. This proposal was later referred to sometimes as the *Hirzebruch-Plan* for Oberwolfach. Discussions about it among German mathematicians continued for awhile, and finally resulted in the clarification of two more or less separate issues:

(i) securing the further existence of the institute at Oberwolfach, mainly as a mathematical conference centre, and
(ii) founding a new German mathematical research institute.

In order to provide a legal basis for pursuing both aims, the *Gesellschaft für mathematische Forschung e.v* (GMF) was set up in June 1959. Thereafter, representatives of the federal ministry of the interior and the Baden-Württemberg ministry of culture approached the *Max-Planck-Gesellschaft* about the two issues.[10] A commission of the MPG thoroughly discussed the double application with representatives of the GMF on October 29, 1959, and January 5, 1960. To understand the issues at stake, one has to know a little bit about the *Max-Planck-Gesellschaft*.

The Max-Planck-Gesellschaft (MPG)

There are about fifty Max-Planck-Institutes in West Germany today, that is, about 50 individual research institutes administered to a certain extent by the general administration of the *Max-Planck-Gesellschaft* in Munich. These institutes are very much different from each other, in their domain of research, size, organization, budget and financial dependence on the MPG. Some 20 among them work in certain areas of biological/medical research; about the same number make up the so-called chemical/physical/technical section of the MPG (this is where the MPI for mathematics is categorized as well), and the rest work in specialized areas of law, psychology, history and the like.[11] The only way to "understand" this somewhat confusing picture of the Max-Planck-Institutes, as well as the internal set-up of the MPG and its finances, would be to look at the history of the MPG and of the individual MPIs.

Around the turn of the century, many scientists (among mathematicians, especially Felix Klein who initiated a *Göttinger Vereinigung zur Förderung der angewandten Physik und Mathematik*) as well as industrialists felt that the German *Kaiserreich* was in danger of lagging behind the U.S. and other nations in industrial development and technical innovation. Many industrialists were prepared to invest in fundamental specialized research (there was also a wave of interest among private foundations in the U.S.). In addition, the last German Emperor, Wilhelm II, was eager to present himself as the greatest friend and sponsor of science and technology. Thus, on January 11, 1911, some seventy businessmen, the Emperor, with his wife and a few members of the court, and only four scientists gathered in Berlin for the constitutional meeting of the *Kaiser-Wilhelm-Gesellschaft* (KWG). At first, the Emperor was more patronizing than paying for the new society. The first institutes were founded

The old Lorenzenhoff at Oberwolfach

and entertained almost exclusively from the private funds put into the KWG.[12]

Very quickly, the Kaiser-Wilhelm-Institutes (KWIs) responded to the most prominent scientific trends of the day. Einstein had "his" KWI in Berlin (as of October 1917),[13] and so did Fritz Haber, the father of industrial synthetic ammonia and chemical warfare.[14] The KWI most closely related to mathematics was the one for Fluid Dynamics in Göttingen. Felix Klein lobbied for its foundation during the last years of his life, and when it was finally established in 1925 (with Ludwig Prandtl as director), a particularly close connection developed between it and the Göttingen Mathematics Institute under Courant.[15] In the Twenties, the financing of the KWG had already been largely assumed by the state, which was not necessarily more reliable; e.g., a change in the government jeopardized the construction of Prandtl's institute, and one had to resort to a private donor again.

During the Third Reich, the KWG tried to get along with the new regime, and sided with the industry in order to defend itself against party influence. After World War II, the official centre of the KWG remained in Berlin where the Soviets declared the chemist Robert Havemann temporary president of the KWG, in July 1945. But in reality, a small but active group of people around Ernst Telschow, operating from a small apartment in Göttingen, slowly managed to reassemble the KWG, or rather, its institutes in the British and American zone (and later, with difficulties, also in the French zone). Since the last president of the KWG, the industrialist Albert Vögler, had committed suicide in an American POW camp, Telschow persuaded Max Planck (then 87 years old) to act once again as president until Otto Hahn's release from England (spring 1946). The British and American officials finally accepted the continuation of the KWG, but insisted on a new name (as the social democrats had vainly tried to do in 1918). Thus on September 11, 1946, the *Max-Planck-Gesellschaft* was constituted (first in the British zone only).[15] Again, private help was essential at first, until more and more guarantees were given by the state. Today, private funds are down to 6 percent of the budget. But industry continues to be well represented in the senate of the MPG.

For some time at least, it seems to have been the main idea of the KWG/MPG to sponsor research which was not adequately covered by the universities. Also, the unity of research and teaching was seen as restricted to the universities, and was not to be applied in the KWIs—according already to the authors of the first memoranda about the KWG.[16] (In practice, of course, many scientists of the KWIs/MPIs, like Prandtl, were—and are—also teaching at the local university.) More importantly, Max-Planck-Institutes still tend to be constructed around a single person who then imposes his particular area of research on "his" institute. (This is why institutes are sometimes closed down when no adequate successor is found.) Within this overall structure, KWG and MPG have proven to be tremendously efficient and flexible in providing support in every way possible for the research and researchers they have once chosen to sponsor.

What Is Good for Mathematics?

In 1959–60, as we have seen, a *Max-Planck-Institut für Mathematik* was officially taken into consideration. While the commission formed by the MPG was *a priori* very sympathetic to the idea of doing something for mathematical research, it was less obvious how the projects proposed by the mathematicians could be fit into the structure of the *Max-Planck-Gesellschaft*.

First of all, a director for the institute had to be proposed. On December 17, 1959, Köthe (Heidelberg) wrote to Hirzebruch who was visiting the IAS for the second time and asked him to accept the nomination. Hirzebruch's reply was a little hesitant, mentioning in particular how attached he had already become to teaching and to his students in Bonn. But he accepted.

Secondly, the idea had been to promote research in mathematics, with varying emphasis on certain subjects, depending on the visitors present at the time. This, in addition to the mere fact of having mostly visitors and few permanent staff, was unusual for a Max-Planck-Institute. Considerable effort was taken by the mathematicians to explain to the MPG commission their view of how mathematical research differed from the natural sciences (e.g., no experimental apparatus), as well as from the humanities (no large quantities of material to be collected and studied).

Probably it was disadvantageous to have the two parallel issues (continuation of Oberwolfach and foundation of a new institute) in a joint application. In fact, many of the typical Oberwolfach features "spilled over" into the project of the new institute, and no clear priority list was outlined in the memorandum submitted by the applicants after the discussion with the MPG commission.[17] Moreover, no particular site was proposed for the new institute, in the event that it was to be separated from Oberwolfach. As time went on, Freiburg, Göttingen and Bonn were mentioned as possibilities.

Still, prospects for the new institute looked fairly good until the reports came back from the mathematicians that had been asked by the MPG to evaluate the project. They were not so much actually negative (except, apparently, for the criticism of Hirzebruch's mathematical methods by Siegel, which had to be expected because by that time Siegel was already firmly entrenched in his antimodernistic stand in algebraic geometry). However, they must have been incredibly confusing for the members of the MPG commission who, of course, did not know their way around in the

world of mathematics.[18] Courant's four-page letter, dated July 12, 1960, had the longest lasting effect, presumably because he stated in the final paragraph that there was no need to treat it confidentially. The preceding sentence, however, was rarely quoted: *"Meine Bemerkungen sind nicht sorgfältig ausgearbeitet"* ("My remarks have not been carefully worked out"). In fact, his letter was obviously written very quickly, and emotionally at that.

It opens up with an angry comment by the man who had been chased from Göttingen by the Nazis; instead of vaguely lamenting the current situation regarding mathematics in Germany, the authors of the project should have named the true, viz. political, reason for this state of affairs! Then, Courant abruptly moves into the favourite leitmotiv of his later years[19]: the danger of boundless abstraction in mathematics, and the necessity of reestablishing an equilibrium between abstract and concrete, pure and applied mathematics—an equilibrium which, he thinks, has recently been threatened by the success of certain pure branches. He goes on to express his concern for the young generation of German mathematicians, who are seduced by the beautiful new results of pure mathematics and are growing up in a climate of traditional hierarchies (as opposed to the relaxed atmosphere of American universities), and with too few positions opening for them.

In his answers to the precise questions posed by the commission, Courant puts forward a very rough sketch of a mathematical research centre of a kind yet more alien to the idea of an ordinary MPI than that of the original project (although it may be that he was inspired by Einstein's KWI[13] when making this proposal). His idea is for a small bureau which, with the help of a substantial budget, could create professorships (mostly not pure research positions) wherever it seems wise to add them to the existing positions at a university. Thus, *all* branches of mathematics could profit from such an "institute." Courant's great respect for Hirzebruch leads him to conclude that he should *not* be acquitted of his teaching duties, and makes him sensitive to the fact that Hirzebruch, as director of an MPI for mathematics, would promote "abstract tendencies" in mathematics too conspicuously.

Considering, among other things, that one of the members of the MPG commission was Walter Tollmien, Prandtl's successor at the MPI for Fluid Dynamics in Göttingen, it is likely that at least Courant's concern for applied mathematics did not fail to impress the commission. But above all, the reaction seems to have been utter confusion. The head of the commission, F. Wever of the MPI for Iron Research, met with Heinrich Behnke (Münster) several times to sort out what was to be made of this and the other confusing letters. After the second meeting, Behnke was very optimistic about having convinced Wever that the disparity of the opinions expressed was not as bewildering as it first seemed.

But Behnke always was a very optimistic man. In the final meeting of the MPG commission (October 7, 1960), and then also in the *Senat* of the MPG (November 11, 1960), the *Max-Planck-Gesellschaft* preferred to stay away from this bewildering universe of mathematicians, whose ideas seemed so unlike those of the MPG.

It was decided, however, to write a memorandum: *Denkschrift über die Förderung der Mathematik in der Bundesrepublik Deutschland*, trying thus to induce somebody else to feel responsible for mathematical research in Germany. Unfortunately, this *Denkschrift* still reflects the confusion created by the reports. It draws very heavily on Courant's letter, but evidently without properly understanding what Courant was alluding to when he talked about abstract versus concrete mathematics. Thus, mathematicians tended not to use this *Denkschrift* when looking for money.

In the aftermath of this failure, Oberwolfach could be saved (with the help of A. Butenandt, then president of the MPG) by a temporary grant from the *Thyssen-Stiftung*. In 1967 and 1974, the Volkswagen Foundation built the two new buildings of the institute which is otherwise financed by the *Land* of *Baden-Württemberg*. The dossier on a *Max-Planck-Institut für Mathematik* was closed for the time being, and for a few years no steps were taken in the direction of a research centre for mathematics in Germany.

The *Sonderforschungsbereich* (SFB)

The *Deutsche Forschungsgemeinschaft* (DFG) is the German analogue of the American NSF, or French CNRS. It was first founded in 1920.[20] If any West German agency could ever come close to putting into practice Courant's idea of a central bureau instituting special mathematical positions at selected universities, it would have to be the DFG. However, this was not what the DFG was ordinarily doing at the beginning of the sixties. The principal way in which it helped (and still helps) scientific research is through stipends and other kinds of grants to individual researchers (in all areas of science and the humanities). Apart from that, there was (and still is) a number of research projects that were sponsored by the DFG in its priority program (*Schwerpunktprogramm*)—preferably of the kind that require the joint effort of scientists from various disciplines. But here, the idea is to promote projects particularly desirable for society (e.g., new technologies), and which typically demand a major financial effort. Pure mathematics, alas, does not qualify by any of these criteria. So the right way of fostering mathematical research on more than an individual level was still to be found when, at the end of 1960,

the MPG memorandum was circulated among German research agencies, and thus reached the DFG, also.

But as I pointed out earlier, mathematicians were not very keen to use this memorandum as a starting point for further manoeuvres, anyway. Instead, what made it possible for Hirzebruch to start working towards the Bonn *Sonderforschungsbereich* was a new perspective in German research politics, proposed by the *Wissenschaftsrat* (science council) in 1960.[21] This circle of administrators and scientists has to constantly revise research planning in West Germany. In 1960, the *Wissenschaftsrat* decided it was not reasonable to act as if, in principle, every university should try to be excellent in each discipline, at every given time. In actual fact, of course, some universities tend to be better than others in certain fields. But, the *Wissenschaftsrat* said, this should be perceived as a starting point to a more efficient promotion of high quality research. Thus, it called on the universities to select their particular research priorities (*Schwerpunkte*) for the next 10 to 20 years, promising that eventually extra funds would be available for a well laid out priority program. In 1967, in order to avoid confusion with the *Schwerpunktprogramm* of the DFG, the council renamed its *Schwerpunkte* into *Sonderforschungsbereiche* (special research areas), and the actual administration of the money, available as of 1968, was conferred to the DFG.[21]

From 1962 to 1964, Hirzebruch was dean of the natural sciences faculty at Bonn. So he was automatically involved in discussions about which sciences should get priorities at Bonn University. Proposals were shaping up slowly, but mathematics was included from the very beginning. (Another area pushed very strongly at Bonn ever since the sixties is radio astronomy.) Finally, by 1968, a detailed application for an SFB in pure *and* applied mathematics had been drafted. Besides Hirzebruch, pure mathematics was represented mainly by Jacques Tits (who had come to Bonn from Brussels in 1964), Wilhelm Klingenberg (as of 1966), and Günter Harder (starting in 1967). The principal applied mathematicians involved in planning the SFB were Rolf Leis and Heinz Unger. But a single SFB for both pure and applied mathematics seemed too big and unspecific. So the DFG reviewers proposed to split the project in two. In order to avoid the somewhat unfortunate distinction of pure versus applied mathematics, new names were suggested: *Theoretische Mathematik* for the future SFB no. 40, and *Approximation und mathematische Optimierung in einer anwendungsbezogenen Mathematik* for what was to become SFB no. 72.

The SFB project did not meet the same stumbling blocks which had caused the MPG to abandon the 1959 proposal. It is true that SFBs were supposed to involve researchers from more than one field. But it could safely be argued that this SFB was going to be "interdisciplinary" within mathematics. The applicants were still going to teach their courses, as before. It could even be argued that the presence of visiting mathematicians would prove beneficial to the more advanced students, and thus might make Bonn more attractive to students of mathematics in general. Also, the university of Bonn, which, after all, had to administer the SFB funds to be granted by the DFG, proved willing to provide office space for the SFB in Beringstrasse, next door to most of the offices of the mathematics department.

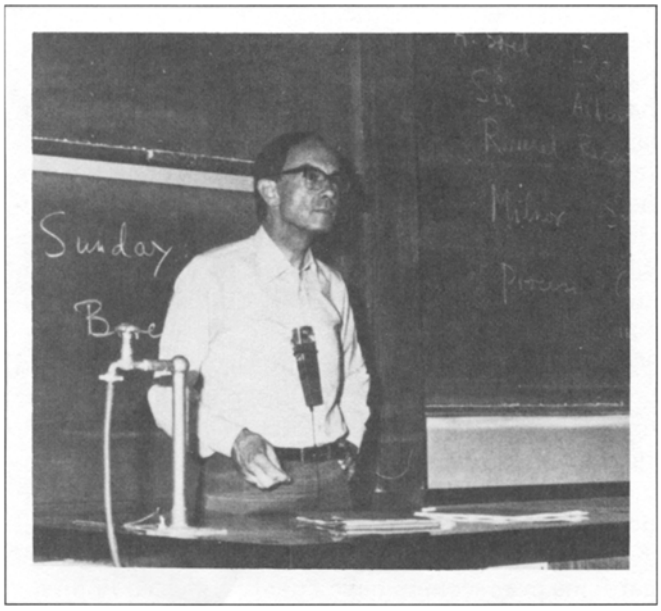
The mathematical particularity that the SFB would have a very high share of visiting positions over permanent ones did not contradict the notion of SFB, simply because such a notion only existed in the vaguest sense when the whole program was getting off the ground at the end of the sixties. Finally, to the best of my knowledge, during the sixties no other mathematicians ever seem to have openly criticized Bonn for trying to move ahead under the auspices of the priority program. This does not mean that some might not have had mixed feelings about the project. But on the whole, Bonn mathematics had gained a tremendous reputation by the end of that decade.

Thus, after some six years of preparation, the *Sonderforschungsbereich 40, Theoretische Mathematik* was constituted at Bonn University in 1969. In its first year, it received the amount of DM 143,525.00 from the DFG (via the university). The SFB 72 followed in 1970.

For reasons of space we cannot give an account of the mathematics done at SFB 40. Many readers will know mathematicians who have spent some time in Bonn, or will have heard of results connected in some way with work of the SFB. The triannual sequence of detailed applications for the continuation of funds and reports on past work can provide extensive information to anyone more specifically interested in the activities at SFB 40.[22]

Founding the Institute

Sonderforschungsbereiche are limited in time. How long an SFB is kept up will certainly depend on the goals it was intended to fulfill and on how well it functions. But before it is fifteen years old, the question of when it should be closed down or transformed into something else will not fail to come up during the regular triannual reviews. One may wonder whether this is always a reasonable procedure; however, it is unequivocally stated in the regulations defining what an SFB should be.[23] Already, in the early seventies, attempts were made to introduce more permanent elements into the mathematical centre created at Bonn by the SFB. Among them, the idea of a *Max-Planck-Institut für Mathematik* briefly reappeared. But it had to wait until the SFB had grown older.



F. Hirzebruch (1983)

In 1977–78 Hirzebruch had a few conversations with Reimar Lüst, then president of the MPG, about the possible perspectives of mathematical life at Bonn after the eventual closing down of the SFB. The last meeting took place in September 1978, during a general scientific meeting at Innsbruck. Thereafter, Lüst asked Hirzebruch for a more detailed account of how the SFB could be transformed into an MPI. So, Hirzebruch wrote (November 1, 1978) a three-and-a-half-page letter which was going to be the basis for most of the future discussions inside the *Max-Planck-Gesellschaft* about an *MPI für Mathematik.* The letter starts with a quotation from the application for the SFB budget for 1977–79: ". . . The SFB plays a role similar to that of the IAS at Princeton or the IHES at Bures-sur-Yvette. . . . Mathematicians from Germany as well as from abroad are invited for one or two years to be able to concentrate on their research, in a mathematically stimulating atmosphere. Their area of research should fall into the working areas of the SFB. But unlike those institutes, the SFB functions inside a university." The fact that the SFB was tied in closely with the university was seen positively in the report (contact with advanced students, teaching possibilities for members of the SFB), although it was also mentioned that this sometimes led to "excessive stress put on the Bonn members of the SFB," who had to do their full teaching and their share in university administration, and were also trying to profit from the SFB as much as possible.

Hirzebruch's letter goes on to say that

> the successful work of the SFB has shown that a mathematical research institute, in addition to the other European institutes and in particular to the IHES, would meet a real demand. Persons holding positions both at the institute and the university could maintain the close contact with a university.
>
> The SFB has recently regrouped its research program in five working groups:
>
> 1) Algebraic groups and arithmetic subgroups
> 2) Modular forms, number theory
> 3) Algebraic geometry, complex analysis
> 4) Algebraic topology
> 5) Differential geometry, variational calculus.
>
> This covers a good part of mathematics. At the MPI it would be possible to also include other disciplines, in particular partial differential equations and mathematical physics, extending group 5. . . . The main directions of research would have to be modified according to the development of mathematics. It would also be possible to stress one area more than others, for two years in a row, by inviting many mathematicians who have done excellent research in that area.

There follows a discussion of positions available at the SFB (namely, four grades of research positions with respectively, 4, 4, 8, 16 jobs) which, Hirzebruch says, had proved to be a convenient structure for constituting working groups of a productive size, which also communicate among each other.

> . . . If the number of staff were to be changed I would rather cut it down a little bit than expand it.
>
> The SFB also invites mathematicians for short stays, from a few days up to three months. DM 19,000.00/year are set aside for this. Furthermore, there are DM 24,000.00/year for smaller conferences of the working groups (taking turns), and DM 31,000.00/year for the *Arbeitstagung* . . . These activities could be continued by the MPI . . .

The letter closes with the remark that, so far, all the ideas proposed to Lüst are only Hirzebruch's personal initiative. In fact, the SFB was officially informed of the project only later, on April 18, 1980.

In February/March 1979 the MPG decided to form a commission again (as in 1959) to scrutinize the project. This time things went more smoothly; not only was there a well established SFB to go on from, but since 1959 the need to do something for mathematical research had been stated repeatedly in German research policy papers. On March 7, 1980, the senate of the MPG decided to found the *Max-Planck-Institut für Mathematik,* with Hirzebruch as director, provided that an agreement could be reached between the federal government and the states to secure the financing.

We jump over the phase of detailed negotiations that followed, and, rather, describe their final outcome in a few words:

The SFB is going to end on December 31, 1985. By then, the MPI will have reached its full capacity. In the meantime, DFG and MPG split the budget of the visitors' positions according to the approximate ratios of 75%/25% in 1983, 50%/50% in 1984, and 25%/75% in 1985. (Incidentally, the DFG just started a new, smaller mathematical SFB—"Analysis and Geometry," at Göttingen University.)

As Hirzebruch had suggested, the structure of the MPI continues that of the SFB. The most important difference is the somewhat more pronounced separa-

tion from the university mathematics department. However, this is mostly a result of the location (see below), not of the fact that the MPI has its own administration and does not depend on the university administration as the SFB did. In fact, Hirzebruch keeps his chair at the university, albeit with a modestly reduced teaching load (more frequent sabbatical semesters). Also, he is no longer required to attend administrative faculty meetings. Don Zagier, for the time being the only "Scientific Member" of the MPI (the analogue of a full professor), offers a course at the university every other semester, that is, for each term he spends at Bonn. On the other hand, there is G. Harder as "external" Scientific Member which, in Max-Planck nomenclature means that he is, in the first place, professor at Bonn University, but is also supposed to be present at the MPI on a regular basis.

As for the mathematicians with non-permanent positions at the MPI, in particular the visitors, their contact with the university department will depend on whom they are collaborating with, or which seminars they attend. Communication with the department seems to be especially intense at the level of the graduate students, some of whom are writing their theses at the MPI, profiting from one of the stipends available there. There is now working space for 57 mathematicians at the MPI. (But around the twenty-fifth *Arbeitstagung*, in June 1984, there were more than 60 people working in the house.) The budget of personnel (including the visitors program) started at DM 81,700.00 in 1981, and is planned to reach DM 2,204,800.00 in 1985. Thus the proportions of the SFB are intact.

On January 20, 1982, the *Max-Planck-Institut für Mathematik* moved into its home, on Gottfried-Claren-Strasse 26, at Bonn-Beuel. The choice of building had been extremely difficult. Beuel is situated on the right bank of the river Rhine, opposite the centre of town or, as local people say in their dialect, *op de schäl Sick*, on the weird side of the river. (Historically, Beuel was a separate small town of craftsmen and laundry women. Some old crooked streets with tiny, but unromantic, little houses still tell about the petit-bourgeois background of this town which became a part of Bonn less than ten years ago.)

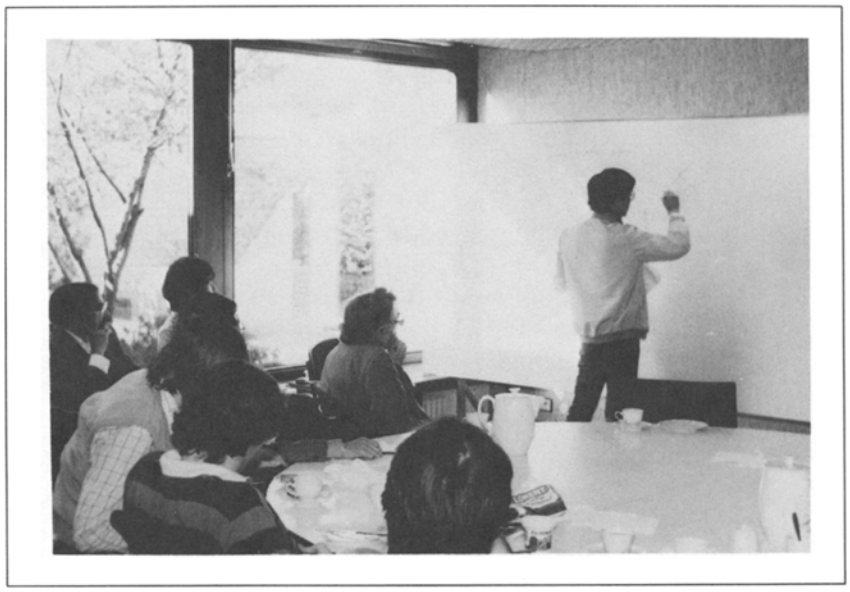
The problem is that it is hard to get from the MPI to the university department in less than 15 to 20 minutes. This distance caused the SFB conference to turn down the building in Gottfried-Claren-Strasse. The plan to move to Beuel was abandoned in February 1981. But no other reasonable building turned up. A very run-down house just around the corner from the mathematics department had to be abandoned because absolutely no scheme of renovation could be negotiated with the proprietor. So when nothing worked, in May 1981, the beautiful house in Beuel was called up again. It was still available, and negotiations of the contract proceeded rather smoothly. In the long run, a special building for the institute will be considered. (A Los Angeles-like project of having the institute riding on a bridge across a freeway has already been turned down). Except for the lack of a really good lecture room (with high ceilings and nice big blackboards), the house at Gottfried-Claren-Strasse offers perfect accommodations for the offices which form apartment-like groups with little kitchens. The architecture is sufficiently compact to favour communication between the inhabitants.

Max-Planck-Institut on Gottfried-Claren-Strasse 26

It might be argued that the distance between the MPI and the department is not that serious: in Paris, working mathematicians tend to spend at least three to four hours every week commuting in the Paris region. But serious or not, the new location has clearly modified the interaction between mathematicians at Bonn in a way which many people at the department tend to regret. Mathematicians at the MPI feel the separation most strongly when they need a journal or book that does not (yet) exist at the institute's library. The library is being built up with increased funds during the first few years. It tends to be very good on new books and often lacking on older journals. The preprint series put out by the MPI serves to get a certain number of journals (sometimes also back volumes) by exchange. But the number of journals kept at the MPI will probably remain constant at about 60 or 70, i.e., roughly one third of what one would expect of a good department library.

1983–84 at the Max-Planck

1983 had been a good year for number theory: G. Faltings proved Mordell's conjecture, and a little earlier B. H. Gross and D. Zagier had announced their theorem on the derivative of certain L-functions related to modular curves which, among other things, is a step towards the conjectures of Birch and Swinnerton-



Conference room in the Max-Planck-Institut

Dyer. Both theorems were extensively treated at the MPI in 1983–84. During the winter semester, G. Wüstholz (who holds a five-year position at the MPI) organized a seminar with Faltings (who came to Bonn from Wuppertal once a week) which covered the complete proof of Mordell's conjecture as well as an introduction to Faltings' Arakelov theory of arithmetic surfaces, resulting in the first book published on Faltings' proof.[24] From March through May of 1984 the author organized a series of lectures on the theorem of Gross and Zagier. Here, as in the seminar of Faltings and Wüstholz, the author of the proof (or rather, one of them, Don Zagier) could present parts of it himself.

Still in the number theoretic vein, a two-week workshop was held in March 1984 on the cohomology of arithmetic groups. It was organized by J. Schwermer, with speakers including A. Borel, W. Casselman, G. Harder, St. Kudla, J. Millson, M. S. Raghunathan and J. Rohlfs.

There were five regular seminars held at the MPI every week: the Algebraic Surfaces Lunch directed by Hirzebruch, Namikawa's Algebraic Geometry seminar (Namikawa has been a frequent visitor to the SFB, and spent two years at the MPI before returning to Japan in October 1984), the *Oberseminar* of Harder, Hirzebruch and Zagier (a colloquium rather than a seminar addressed to specialists), the Topology seminar directed by Baues, and the number theory seminar called Modular Forms Lunch, which was directed by the author during his stay at the MPI.

Furthermore, a working group on infinitesimal variations of Hodge structures was organized by H. Knörrer and G. Wüstholz. It was part of the joint activities of the algebraic geometers at the MPI and at the mathematics department. They met more often at the department in the *Oberseminar* directed by E. Brieskorn. Participants from the MPI included K. Behnke, H. Esnault and E. Viehweg.

Finally, in an area of research which used to be at the borderline between SFB 40 and SFB 72, A. Tromba (U. C. Santa Cruz) organized a seminar on partial differential equations at the MPI in 1983–84. It was aimed at the study of non-linear PDE and its applications. The Tromba-group consisted mainly of visitors spending a few months in Bonn, mostly in the summer. Speakers included H. Eliasson (Reykjavik), R. Finn (Stanford), J. Kazdan (Berkeley), V. Moncrief (Yale), W.-M. Ni (Minnesota), T. Ratiu (Berkeley), H. Wente (Toledo) and S. Wolpert (Maryland).

The Twenty-Fifth *Arbeitstagung*

The 1984 *Arbeitstagung*, June 15–22, was the twenty-fifth that Hirzebruch had organized since 1957. So it was decided to celebrate the occasion by slightly changing the established routine. These changes included a number of survey talks assigned in advance, whereas usually the choice of lecturers and lectures "spontaneously sprang from the audience," as Atiyah put it in his inimitable mixture of irony and earnestness. Also, the proceedings are about to be published as a Springer Lecture Notes volume, rather than being handed out at the end of the week as handwritten brochures to take home. There was also an exhibition on the occasion of the 25th *Arbeitstagung*. It was entitled *Morphologie komplexer Grenzen*, and featured pictures of Julia sets, like those well known to readers of *The Mathematical Intelligencer*. (The pictures were realized by the *Forschungsgruppe "Komplexe Dynamik,"* H. O. Peitgen and P. H. Richter of the University of Bremen).

The *Arbeitstagung* attained a record size in 1984. Roughly 200 individual invitations had been sent out, as well as 56 global letters to German universities. During the first four days of the *Arbeitstagung*, some

250 mathematicians were attending lectures. No individual theorem dominated this conference, as had been the case a year before with Faltings' proof of Mordell. Instead, a certain feeling of unity of mathematics, a sense of a "greater coming together" permeated many discussions during this week. At the end of the conference, Serge Lang wrote:

> One of the striking features of this year's *Arbeitstagung*, perhaps more than any other, was the deep interdependence of the subjects discussed, ranging over algebraic geometry, topology, analysis, differential geometry, and number theory, with even the mathematical structures which occur in physics also coming up. For instance we have Arakelov type theories, where the differential geometry of a variety constitutes the study of its component at infinity. This involves the study of various metrics, among other things, and no metric at the moment seems to play a more important role than others. In a survey article called *New Dimensions in Geometry*, Manin draws attention to Hermite-Einstein metrics on which fundamental work has been done by Yau, Aubin, Donaldson. I found these connections and analogies more exciting than ever.

Manin himself could not attend the *Arbeitstagung* in person. One of the Soviet mathematicians who did come, A. Parshin, had this to say about the conference:

> I think that the *Arbeitstagung* was very fruitful and extremely rich in new ideas and results. For me the most impressive talks were Donaldson's, Siu's and Wolpert's. Also I think that it was a good idea to have some survey talks. But the spectrum of these lectures could be a little bit broader. For example, such things as dynamical systems were not presented.

Simon Donaldson, too, found it "very interesting to see common themes (or perhaps fashions) in many of the talks," but added immediately, "this is presumably thanks to the wisdom of the organizing committee. . . ."

There will be no *Arbeitstagung* in 1985. But, apart from a special seminar on D-modules (organized by H. Esnault and H. Knörrer) and a continuation of the Faltings-Wüstholz seminar (this time on Hodge-Tate structures and the compactification of A_g over $\mathbb{Z}$), there will be extra activities going on at the MPI which will certainly keep the year 1984–85 (and May–June 1985 in particular) from being dull for the Bonn mathematicians. Thus, Wüstholz is organizing a short meeting in November, and a larger workshop on transcendence and diophantine approximation in the summer. Harder and Schwermer will be organizing a special activity on arithmetic and automorphic forms, and Zagier a workshop on computers in mathematics. Last but not least, in June 1985, Atiyah and Hirzebruch are holding a workshop on links between geometry and mathematical physics. Presumably, this flexibility provided by the MPI to invite experts of a certain field in order to bring together a workshop, will be used more and more in the future.

Programm der Mathematischen Arbeitstagung 1984

Freitag, den 15.6.1984

16.30–17.30 Uhr—*J. Tits:* Groups and group functors attached to Kac-Moody data

Samstag, den 16.6.1984

10.00–11.00 Uhr—*M. Atiyah:* The eigenvalues of the Dirac operator

11.30–12.30 Uhr—*A. Connes:* K-theory, cyclic cohomology and operator algebras

17.00–18.00 Uhr—*G. Segal:* Loop groups

Sonntag, den 17.6.1984

9.45–10.00 Uhr—Festlegung der nächsten Vorträge

10.00–11.00 Uhr—*G. Harder:* Special values of Hecke L-functions and abelian integrals

11.45–12.45 Uhr—*H. Wente:* A counterexample in 3-space to a conjecture of H. Hopf

15.30–16.30 Uhr—*G. Faltings:* Compactification of $A_g/\mathbb{Z}$

17.00–18.00 Uhr—*C. T. C. Wall:* Geometric structures and algebraic surfaces

Montag, den 18.6.1984

10.00–11.00 Uhr—*J. Harris:* Recent work on Hodge structures

13.00 Uhr—Schiffsausflug nach Linz. Abfahrt pünktlich um 13.00 Uhr mit Motorschiff "Carmen Silva" am Alten Zoll

Dienstag, den 19.6.1984

9.45–10.00 Uhr—Festlegung der nächsten Vorträge

10.00–11.00 Uhr—*Y. T. Siu:* Some recent results in complex manifold theory related to vanishing theorems for the semipositive case

11.45–12.45 Uhr—*W. Schmid:* Recent progress in representation theory

15.30–16.30 Uhr—*W. Ballmann:* Manifolds of non-positive curvature

17.00–18.00 Uhr—*B. Mazur* und *CH. Soulé:* Conjectures of Beilinson on L-functions and K-theory

Mittwoch, den 20.6.1984

10.00–11.00 Uhr—*H. O. Peitgen:* Morphology of Julia sets

11.45–12.45 Uhr—*S. S. Chern:* Some applications of the method of moving frames

15.30–16.30 Uhr—*S. Lang:* Vojta's conjecture on heights and Green's function

17.00–18.00 Uhr—*S. Donaldson:* 4-manifolds with indefinite intersection form

Donnerstag, den 21.6.1984

10.00–11.00 Uhr—*D. Zagier:* Modular points, modular curves, modular surfaces and modular forms

11.45–12.45 Uhr—*G. van der Geer:* Schottky's problem

15.30–16.30 Uhr—*R. Bryant:* G_2 and Spin(7)-holonomy

17.00–18.00 Uhr—*S. Wolpert:* Homology of Teichmüller spaces

Freitag, den 22.6.1984

10.00–11.00 Uhr—*J. P. Serre:* l-adic representations

11.45–12.45 Uhr—*M. F. Atiyah:* On Manin's manuscript "New dimensions in geometry"

14.30–15.30 Uhr—*N. Kuznetsov:* On Lehmer's conjecture $\tau(n) \neq 0$ (*Sondervortrag*) im Max-Planck-Institut für Mathematik)

16.30–17.30 Uhr—*C. T. C. Wall:* Real and complex singularities (*Kolloquiumsvortrag*)

Endnotes

[1] The letter, dated Zürich 9 Oct. 1933, is in the old files of the Göttingen Mathematics Institute and in various files of the Göttingen University Archives.

[2] H. Weyl, *Gesammelte Abhandlungen* (Springer-Verlag, 1968), vol IV.

[3] See last paragraph of letter quoted in fn. 1, and notice in Göttinger Zeitung 25. Jan. 1933. Cf. N. Schappacher, "Das Mathematische Institut (1925–1950)," contribution to a forthcoming volume, *Zur Geschichte der Universität Göttingen im Nationalsozialismus.*

[4] See A. Flexner's autobiography *I remember* (New York, 1940), p. 385.

[5] See, e.g., C. Reid, *Courant in Göttingen and New York* (Springer-Verlag, 1976), pp. 157, 204, 229.

[6] "Arbeitstagungen des Mathematischen Instituts und des Sonderforschungsbereiches 'Theoretische Mathematik' der Universität Bonn 1957–1979." Brochure compiled by the Sonderforschungsbereich 40, Theoretische Mathematik, Bonn, April 1979.

[7] N. Kuiper and R. Bott were, in 1957–58, the first visitors profiting from such a position. Then there were also courses taught by A. Dold (Heidelberg), W. Klingenberg (Göttingen), R. Remmert (Münster) and R. Thom (Strasbourg); they would come to Bonn every week to deliver their lectures.

[8] This brief account of the foundation of the Oberwolfach institute is very sketchy and tentative. As for references, see H. Gericke, "Das Mathematische Forschungsinstitut Oberwolfach," in *Perspectives in Mathematics, Anniversary of Oberwolfach 1984* (Birkhäuser, Basel, 1984), pp. 23–39. A more detailed and lively account of the wartime history of Oberwolfach is given by Irmgard Süss: "Origin of the Mathematical Research Institute Oberwolfach at the Country-seat 'Lorenzenhof'," and "The Mathematical Research Institute Oberwolfach Through Critical Times," in *General Inequalities*, vol 2, resp. 3, ed. by E. F. Beckenbach, W. Walter (Birkhäuser, Basel, 1980, resp. 1983), pp. 3 ff. (This report as well as its original German version is also available at Oberwolfach.)

Cf. also the beautiful brochure "Mathematisches Forschungsinstitut Oberwolfach—Anniversarium 1984—Informationsschrift zu Arbeit, Organisation und Geschichte des Instituts," ed. by Gesellschaft für mathematische Forschung e. V., Freiburg/Br., im Zusammenwirken mit der Stiftung Volkswagenwerk, Hannover.

There is a biographical note on Wilhelm Süss by H. Gericke in *Jber. DMV 69* (1968), pp. 161–183. But the important and voluminous files of W. Süss at Oberwolfach still wait to be studied by historians. For a more political appraisal of Süss's role before 1945, cf. H. Mehrtens, "Die 'Gleichschaltung' der mathematischen Gesellschaften im nationalsozialistischen Deutschland," to appear in *Jahrb. Überbl. Math.*

[9] This and some of the following information I owe to M. Barner, the current director of the Oberwolfach institute. Otherwise, Hirzebruch's own files of the time have been most helpful. Clippings from old MPG files made available to me by B. Fromm (general MPG administration at Munich) mention that the senate of the MPG discussed taking over Oberwolfach into the MPG once in 1952. The application at the time came from inside the MPG (upon the instigation of W. Süss??), and was turned down, in spite of positive reviews of the institute, because, they said, an institute of this kind should rather be sponsored by Deutsche Forschungsgemeinschaft (DFG, see below).

[10] There was also, for some time, the idea of getting Oberwolfach to be sponsored by the *Königsteiner Abkommen*, a treaty among the *states* of the Federal Republic.

[11] A convenient overview is provided by the brochure "Die Max-Planck-Gesellschaft und ihre Institute, Porträt einer Forschungsorganisation." (I was using the third edition, updated to May 1983.) Historical documents were published in the volume *50 Jahre Kaiser-Wilhelm-Gesellschaft und Max-Planck-Gesellschaft zur Förderung der Wissenschaften, 1911–1961, Beiträge und Dokumente*, (Göttingen, 1961). I understand that a new historical study is being prepared for the 75th anniversary in 1986.

[12] An elaborate account of the beginnings of the KWG, full of valuable details as well as marxist ideology is: Günter Wendel, *Die Kaiser-Wilhelm-Gesellschaft 1911–1914, Zur Anatomie einer imperialistischen Forschungsgesellschaft*, (Berlin, 1975).

[13] See, e.g., Abraham Pais, *"Subtle is the Lord. . .", The Science and Life of Albert Einstein*, (Oxford University Press, 1982), p. 525. However, the initial task of this institute was "to administer grants for physics research at various universities. (It became a research institute only after Einstein left Germany.)"—Pais, p. 312 f.

[14] Wendel (fn. 12), p. 212, denies the common story that Haber was the first instigator of chemical warfare, against reluctant military officials. In any case, Haber's institute greatly expanded during the war, and became the centre of development of practical chemical warfare.

[15] See Cordula Tollmien, "Das Kaiser-Wilhelm-Institut für Strömungsforschung verbunden mit der Aerodynamischen Versuchsanstalt," contribution to the forthcoming volume mentioned in fn. 3.

[16] See Wendel (fn. 12), p. 72 and 76.

[17] "Denkschrift zur Gründung eines Mathematischen Forschungsinstituts im Rahmen der Max-Planck-Gesellschaft."

[18] In the final count, eleven mathematicians commented on the project (or aspects of it), and there were evaluations by the *Wissenschaftsrat* and the DMV.

[19] See, e.g., MacLane's comments about Courant in: *Emmy Noether, A Tribute to her Life and Work*, ed. by J. W. Brewer and M. K. Smith, (New York/Basel, 1981), p. 67. Cf. Courant's speech in "Courant-Pohl: Carl Friedrich Gauß—Zwei Vorträge" (Göttingen, Musterschmidt-Verlag, 1955).

[20] For an excellent and fairly complete account of the history of the DFG, see Kurt Zierold, *Forschungsförderung in drei Epochen. Deutsche Forschungsgemeinschaft: Geschichte, Arbeitsweise, Kommentar.* (Wiesbaden, 1968).

[21] See "Empfehlungen des Wissenschaftsrates zum Ausbau der wissenschaftlichen Hochschulen bis 1970," presented July 1967. This neatly summarizes (pp. 126 ff) the 1960 *Empfehlungen* as far as *Schwerpunkte/Sonderforschungsbereiche* are concerned. The passage is reprinted in *DFG Mitteilungen* 4/74.

[22] Cf. also the selective and slightly popularized *Bericht über die Arbeit der Bonner Mathematischen Sonderforschungsbereiche*, compiled by F. Hirzebruch and R. Leis, which features results from the first 15 years of both SFBs. It is going to appear in a comprehensive volume about the SFB program, to be published by the DFG with Chemie-Verlag (Weinheim and Dearfield Beach, Fla.) in 1985.

[23] See, in particular, *Empfehlungen zur Dauer der Förderung von Sonderforschungsbereichen*, Wissenschaftsrat Drs. 5480/81 (Berlin, den 6.11.1981).

[24] Gerd Faltings, Gisbert Wüstholz et al., *Rational Points, Seminar Bonn/Wuppertal 1983/84*, a publication of the *Max-Planck-Institut für Mathematik*, Bonn. Aspects of Mathematics, E6, Vieweg (Braunschweig/Wiesbaden, 1984).

A Quote

German intellect is an excellent thing, but when a German product is presented it must be analyzed. Most probably it is a combination of intellect (I) and tobacco-smoke (T). In many cases metaphysics (M) occurs and I hold that $I_a T_b M_c$ never occurs without $b + c > 2a$.

Augustus de Morgan