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The Past and the Present of the Polish School of Mathematics

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THE PAST AND THE PRESENT OF THE POLISH SCHOOL OF MATHEMATICS

I am concentrating in this article on two main subjects.

Firstly: I am trying to answer the question what brought about such an "explosion" of mathematics in a country in whose scientific tradition there was hardly any mathematics and which happened at the time when after an over-one-century-long foreign rule the nation was trying hard to reconstruct its now independent country, ravaged by the First World War.

Secondly: was this explosion a short-lived enthusiasm or, on the contrary, the Polish school of mathematics struck roots so deeply that it was subsequently able to survive the cataclysm of the Second World War and rebuild in the new circumstances — in People's Poland — the internationally recognized edifice of Polish mathematics?

There will be in this article no mathematical theorems, no definitions or geometrical constructions. I shall be trying to use the language which can be understood without mathematical qualifications.

It is therefore my hope that this text will be intelligible not only to mathematicians.[1]

1. PRECURSORS OF THE POLISH SCHOOL OF MATHEMATICS

It was the years 1918—1920 when the Polish School of Mathematics was emerging. Before describing this period and the subsequent years one should, I think, review, be it only summarily, the contemporary state of Polish mathematics. I am going to mention those of its representatives the majority of whom had in fact been active in the 19th century but who also worked in the 20th century and so could influence the formation of the School of Mathematics being thus its precursors as it were.

The mathematicians I am going to speak of worked for the most part at the institutions of higher education in Cracow and Lwów, that is to say

[1] In writing this article I have made use of numerous bibliographical and historical materials published (in Polish) in Wiadomości Matematyczne (especially on Z. Opial dissertation), as well as of the articles by Cz. Olech in the "Review of the Polish Acad. Sc.," No. 4 (1974) and No. 3—4 (1975), and of my book *A Half Century of Polish Mathematics*. (transl. Andrzej Kirkor) PWN — Pergamon Press 1979.

at schools in the Austrian part of Poland. And precisely these particular schools played a decisive role in the development of Polish mathematics in that difficult period in Poland's history.

In the period under discussion the outstanding scholars were lecturing on mathematics at the Jagiellonian University: Stanisław Zaremba and Kazimierz Żórawski.

Stanisław Zaremba (1863—1942) was an outstanding specialist in analysis. His results in the theory of differential equations and the theory of potential brought him great renown in the world and are still cited today.

Kazimierz Żórawski (1866—1953) was a student of the famous Norwegian mathematician Sophus Lie whom he first encountered during his studies in Leipzig. Differential geometry and theory of continuous groups constituted his field of research, and he obtained important results.

One of the most advanced and distinguished representatives of that generation was Józef Puzyna, professor at Lwów University. His keenest interest included the theory of integral equations (a new mathematical field at that time) and the theory of analytic functions. He was a great specialist in the latter field and presented the analytic functions in a very modern way in his two-volume monograph (1900), in which he also took account of group theory, the theory of sets, topology and harmonic functions. Thus, to some degree, he was a forerunner of ideas which were to blossom in the works of the next generation of Polish mathematicians.

As one can judge from this cursory review the position of Polish mathematics in a part of Poland unter Austrian government (i.e. in Galicia) was not as bad as that; there were at any rate prospects in it for further development.

The situation was incomparably worse in the two remaining parts of the country: in that under Prussian government (whose capital was Poznań) and in the Russian one (whose capital was Warsaw, i.e. in the Congress Kingdom of Poland). In the Prussian part Polish language was forbidden even in secondary and primary schools, and there were no universities at all.

In the Russian part, although the authorities had consented to there being schools teaching in Polish (as a result of the 1905 revolution and of the "great school strike") the situation in institutions of higher education was very difficult indeed.

In the second half of the 19th century, after a short-lived Polish university (under the modest name of the Warsaw Main School), a Russian university was opened which lasted till the First World War. A few years earlier it had been boycotted by Polish youth as an institution of russification.

The lack of Polish institutions of higher education in Warsaw was the most serious obstacle to the development of learning. However, it was not possible to suppress that development entirely. This was due to the deep patriotism of our society which saw clearly that the cultivation of learning — especially during a time of foreign rule — was of immense importance for the preservation of national identity. Acting on that conviction, the enlightened part of society strived after the establishment of such forms of organization as would make it possible to develop Polish learning even in fetters of bondage. Thus, two institutions came into being in Warsaw which were

extremely important for the continuity of culture and learning at that period. One was the Society for Scientific Courses, and the other, the Warsaw Scientific Society.

The Warsaw Scientific Courses, founded in 1906, were a substitute for a university. The activity of the Scientific Courses was confined to conducting lectures because of the many bans introduced by the authorities; it should be added that the lecturers represented the intellectual elite. Mathematics was taught here by Sierpiński (1882—1969) and by Dickstein (1851—1939), who was at the same time the first chairman of the Board of Scientific Courses.

Several years later — when the Russians left Warsaw — the Scientific Courses provided part of the teaching staff for the new established Warsaw University.

The Warsaw Scientific Society, founded in 1907, was a continuation of the first institution in Poland of the type of an academy, notably of the Society of the Friends of Science, formed in 1800 and liquidated in 1832 (after the fall of the November Uprising). The Warsaw Scientific Society played in Warsaw a similar role to that by the Academy of Learning in Cracow.

The establishment of publications was one of the most important sides of the Warsaw Scientific Society's activity. The "Proceedings of the Meetings of the Warsaw Scientific Society" played an especially important role for science in general and mathematics in particular by making possible the prompt publication of scientific results. The first volume of that publication appeared in 1908. This volume contained among others, papers by two mathematicians: Władysław Gosiewski and Wacław Sierpiński.

The existence of an organ in which one could publish the results of one's own research was of great importance for mathematicians. Beside the afore-mentioned "Proceedings" there were in Warsaw, as we have already mentioned, only two permanent publications which printed papers of mathematical content: the "Mathematical and Physical Papers" and the "Mathematical News". Both these journals were published on the initiative and under the editorship of S. Dickstein (the first one jointly with W. Gosiewski and W. Natanson from 1888, the second one from 1897). The periodical "Wektor" is also worth mentioning; edited by W. Wojtowicz it in fact published only a few issues, but these contained quite a few interesting papers by Mazurkiewicz, Steinhaus, Sierpiński, Hoborski and Rudnicki among others.

Thus, it can be seen that the publishing base of Polish mathematics was quite modest. The real flowering had to wait until the restoration of independence.

The First World War brought radical changes in the situation of Polish learning, especially in the Congress Kingdom. In August 1915, the Tsar's armies left Warsaw, and later the whole Congress Kingdom. By November of the same year, two Polish institutions of higher education were launched in Warsaw: The University and the Technical University.

It may appear puzzling that it was possible in such a short time to organize institutions of higher education with entirely new teaching staffs

and completely different structures (the Russian Warsaw University was shortly after the outbreak of war evacuated with all its professors and students to Rostov-on-Don). This peculiar miracle was a consequence of our society's attitude during, and even before, the war. It was a consequence of a deep faith in the restoration of independence, which was maintained with undiminished intensity under conditions of the most severe foreign domination. Thus when the war broke out on August 1, 1914, work on projects for a future independent Poland in its different aspects gained a great impetus.

It was in the Warsaw Civic Committee that a project was prepared to restore Warsaw University as a continuation of the traditions of the Royal Warsaw University, which had been established almost exactly 100 years earlier, as well as of the Warsaw Main School, which had been suppressed half a century before.

The project elaborated by the Civic Committee was very well timed and it was precisely this project which enabled Warsaw's institutions of higher education to be launched so quickly. Professor Dickstein was one of the mathematicians who took an active part in that work.

2. THE POLISH SCHOOL OF MATHEMATICS DURING THE PERIOD BETWEEN THE WARS

Let us recall the "assets" of Polish mathematics with respect to professorial staff in the period immediately preceding the First World War.

In the only two Polish universities, namely in Cracow and Lwów, there were four distinguished professors of mathematics: J. Puzyna, W. Sierpiński, S. Zaremba and K. Żorawski. Wacław Sierpiński recalls that when they met at the Congress of Biologists and Physicians (there were as yet no mathematical congresses in Poland) in 1911 in Cracow, they had no common interests in the field of mathematics, since each worked in a different field: Puzyna — in analytic functions, Sierpiński — in number theory and set theory, Zaremba — in differential equations, Żórawski — in differential geometry. In these circumstances, they could have no students in common, and there was no possibility of organizing a team of mathematicians to work under their direction; in short — there was no chance of establishing a mathematical school.

For that to happen, there had to be a common set of problems on which a number of people were engaged; it did not matter if it was a small group at first, but it had to be sufficiently bright and active in order to attract the interest of other mathematical adepts by its topics. In that respect, the next few years were to bring a chance for the better.

At the time, Sierpiński was almost completely absorbed in set theory. Two young, exceptionally talented and creative mathematicians, Z. Janiszewski (1888—1928) and S. Mazurkiewicz (1888—1945) were working in almost the same field, namely topology. Both took their doctor's degrees in topology (Janiszewski — in Paris in 1912, Mazurkiewicz — in the same year in Lwów, under Sierpiński). Their dissertations which gave them the rank of docents

were also concerned with topology. Finally, both became professors at the same time (in 1915) in the restored Warsaw University (Sierpiński was in Moscow at the time; he took a chair in Warsaw, but only in 1918).

Here they engaged in extraordinarily dynamic teaching activity. Almost all the more gifted students became their pupils.

In the early days of 1918, one could already speak about a fairly strong Warsaw centre of set theory, topology and their applications under the direction of professors Janiszewski, Mazurkiewicz and Sierpiński. The number of their students grew year by year (in the beginning there were B. Knaster, S. Saks and myself, and a short time later A. Zygmunt, A. Tarski, K. Zarankiewicz and Z. Zalcwasser).

The development of a hard-working group of mathematicians linked by common scientific interests was one of the essential factors leading to the creation of the Polish Mathematical School.

A second, no less essential factor, was the conception and keynote of this school, which we owe to Zygmunt Janiszewski.

Near the end of the First World War, the Mianowski Foundation, which sponsored Polish scientists, set up a new publication under the title "Polish Science, Its Needs, Organization and Development", its task being to present the organizational problems of learning in a country regaining its independence. In the first volume of that publication, which appeared in 1918, Janiszewski published an article, "On the Needs of Mathematics in Poland", which presented a conception of Polish mathematics with amazing clarity and precision. Janiszewski began with the assumption that Polish mathematicians could afford "not to be just the recipients or customers of foreign centres", but "to win an individual position for Polish mathematics". One of the principal means suggested by Janiszewski for attaining that end was the concentration of scientific staff in a relatively narrow field of mathematics, but one in which Polish mathematicians had common interests and — what was more important — one in which they had achievements which counted on a world scale. This field was to comprise set theory together with topology, and the foundations of mathematics together with mathematical logic.

As we have seen, this process of concentration had already begun, and Janiszewski was able to base his projects on it. Janiszewski continues: We are far from those forges or melting-pots where mathematics is produced; we come late and must inevitably lag behind.

"Thus, if we do not wish "to lag behind", we must use root and branch expedients; we must get to the roots of this evil. We must create such a forge at home!"

For Polish mathematics to win an independent position on a world scale, which was Janiszewski's key idea, he suggested, beside the concentration of scientific staff, the establishment of a periodical devoted exclusively to those fields of mathematics connected with set theory and the foundations of mathematics. Such a periodical, if published in languages known abroad, would serve a double goal: it would present the achievements of Polish mathematicians to the world of learning, and at the same time it would attract the papers of foreign authors with similar interests; in a word, it

would become an international journal in a field of mathematics which we ourselves had chosen.

"If we wish to acquire a proper position in the world of learning, let us come forward with our own initiative", writes Janiszewski.

And so it happened. The "Fundamenta Mathematicae", the journal initiated by Janiszewski, has served the purposes he had in mind to this very day.

Janiszewski's ideas, reaching, as they did, far into the future created something like a vision of Polish mathematics.

The first volume of the journal "Fundamenta Mathematicae" appeared in 1920. That date may be considered as marking the inauguration of the Polish School of Mathematics.

Although the "Fundamenta" were conceived as an international journal, the first volume deliberately contained only papers by Polish authors. It was something of an introduction to the world of learning of the newly arisen school of mathematics; Here is the list of those authors: Stefan Banach, Zygmunt Janiszewski, Kazimierz Kuratowski, Stefan Mazurkiewicz, Stanisław Ruziewicz, Wacław Sierpiński, Hugo Steinhaus, Witold Wilkosz. This list includes the founders of the school of mathematics and, to a large extent, its later leaders.

Unfortunately, Janiszewski did not live to see this volume in print. He died on January 3, 1920, during an epidemic of influenza which took an immense number of victims at the time.

After Janiszewski's death, Professors Stefan Mazurkiewicz and Wacław Sierpiński took over the post of chief editor. Moreover, Professors Leśniewski and Łukasiewicz belonged to the editorial board until 1928, from which year the present author was also a member (first as secretary to the board, and then — from 1952 — as editor-in-chief).

With over half a century's hindsight, we can only admire both the boldness and the sagacity of Janiszewski's project, in two respects in particular: the "Fundamenta" broke the old rule of publishing Polish authors exclusively in Polish and, secondly, it was a specialized journal, limited to just one field of mathematics. Publication in languages known abroad made our accomplishments accessible to the scientific world on a large scale, and at the same time it was an indispensable condition for attracting the works of foreign mathematicians for publication in the journal and for thus giving it an international character.

Even more revolutionary was the decision to restrict the range of topics discussed in that journal to certain fields of mathematics only. In contrast to the prevalent practice today, where there exist many strictly specialized mathematical journals, in those days it was a novelty which met with undisguised scepticism on the part of many mathematicians. Evidence of this is found in a letter from one of the leading mathematicians of those times, Lebesgue, to Professor Sierpiński on the occasion of the appearance of the first volume. In his letter, Lebesgue — besides many flattering remarks on the papers contained in that volume — voiced serious doubts whether such a specialized journal would have enough material to continue without a decrease in quality. As it turned out, these apprehensions proved unfounded.

The supply of material steadily increased, as did the selection of material and the frequency of published volumes.

In 1978 the "Fundamenta" celebrated the issue of its one hundredth volume!

We have been speaking so far about the Warsaw School od Mathematics. Being directed by Professors Mazurkiewicz and Sierpiński this group consisted, in the thirties, of such outstanding mathematicians as Karol Borsuk, Samuel Eilenberg, Bronisław Knaster, Kazimierz Zarankiewicz in the field of topology; in the fields of set theory and the theory of real functions it included Alfred Lindenbaum, Edward Marczewski, Andrzej Mostowski, Stanisław Ruziewicz, Alfred Tarski.

A couple of years later than in Warsaw, a formidable mathematics centre developed in Lwów around Stefan Banach (1892—1945) and Hugo Steinhaus (1887—1972) with a field of interest different, though fairly related to that of the Warsaw centre. Here the leading subject was functional analysis, which owes its magnificent development to Banach and his students, especially Mazur, Orlicz and Schauder.

The year 1929 saw the launching in Lwów of a journal, "Studia Mathematica", devoted like "Fundamenta Mathematicae" to only one field of mathematics, viz. to functional analysis; it was also published only in international languages. In a short time, the "Studia" became not only the organ of the Lwów School, but also one of the most important international journals in the field of functional analysis.

The principal definitions and ideas of functional analysis were formulated many years before the rise of the Lwów School (by V. Volterra, M. Fréchet, F. Riesz and others). But functional analysis became a mathematical discipline — and, let us add, one of the fundamental disciplines of modern mathematics — due to the works of Banach. According to Professor Mazur, "The year 1922, when Stefan Banach published in the Polish journal, "Fundamenta Mathematicae", his doctoral dissertation is a crucial date in the history of mathematics in the twentieth century. For that dissertation of several dozen pages definitely provided the basis of functional analysis, which — as has been proved by the research of Banach and others — is of paramount importance not only for the further development of mathematics but also of the natural sciences, and physics in particular." In his monograph on linear operations (1929), Banach constructed a unified theory embracing his own fundamental results besides earlier and the most recent ones, some of which had been obtained by his own students. In a short time Banach's monograph became a classic, fundamental work in the field of functional analysis, earning fame for its author as one of the most distinguished of contemporary mathematicians, and great renown for his collaborators and students; the Lwów centre grew to be the most important centre of functional analysis in the world at that time and Stefan Banach became one of the world's leading mathematicians.

The distinguished Soviet mathematician, Prof. Sobolew, speaks of Banach like that: "The Polish nation having given the world such people as Chopin, Adam Mickiewicz, Maria Skłodowska-Curie who have for ever become part of mankind's culture, can be proud of its worthy son — Stefan Banach

whose name will be lastingly connected with the development of mathematics in the 20th century."

The splendid development of functional analysis and the immense activity of Banach and Steinhaus naturally attracted young adepts in mathematics. Around those two scholars there gathered an increasingly large constellation of students and collaborators. In this way there arose, beside the Warsaw School, another Polish school of mathematics, known to the world as the Lwów School.

I have already mentioned the names of the most distinguished collaborators of Banach and Steinhaus. Let us add here the names of docent Stefan Kaczmarz, co-author with Steinhaus of a monograph on orthogonal series; and Marek Kac, then a student of Steinhaus, and later a widely known professor at several universities in America.

Gifted with great talent and brilliance, Stanisław Ulam occupied a special position among the afore-mentioned mathematicians. (He became famous in America during and after the war due to his work in atomic research). Ulam was and is so many-sided that it is difficult to class him among just one branch of mathematicians.

He was my student from the moment he entered the Lwów Technical University in 1927 until he graduated from there with the degree of doctor of mathematics. I consider Ulam one of my most important "discoveries": in 1927 I began teaching a course of Analysis as a newly-made professor; immediately after my first lecture, Stanisław Ulam — for whom it was also the first lecture, approached me with a question which gave evidence both of his advancement and intelligence. From that moment I became interested in him and tried to introduce him to mathematics. In a short time he became my collaborator, as well as an independent mathematician and my close friend. His doctoral dissertation on set theory (relating to a quite fundamental result in measure theory made jointly by Banach and myself) focused the scientific world's attention on that young scientist. Due to his great receptivity and ability to communicate, he closely collaborated with other Lwów professors, such as Banach, Steinhaus, Rubinowicz, also with Borsuk and many others (and later in America, with the brilliant von Neumann).

I have dwelt somewhat longer on Ulam's scientific profile, because he was a very typical representative of the Lwów milieu. Ulam gave a perfect description of it in his article, *Memoirs of the Scottish Coffee-House*. ("Wiadomości Matematyczne" vol. 12, 1969).

The title of that article requires some comment. In both Warsaw and Lwów, café life played a substantial role. Banach in particular was known to spend a considerable part of each day in a café. Surrounded by his collaborators and young adepts, he could discuss and analyse for hours new problems which mostly he himself had posed. A café table became a place of mathematical inspiration, beside the university institutions and the meetings of the Mathematical Society. According to Ulam, "that sort of (coffee house) session with Banach, and more often with Banach and Mazur, made the atmosphere of Lwów unique of its kind. That intimate collaboration was probably something entirely new in the life of mathematics, at least in that

particular form and intensity [...] In our mathematical conversations the whole discussion consisted of a few words inserted between long intervals of meditation, during which we only drank coffee and stared absent-mindedly at each other".

During numerous meetings at the Scottish Coffee-House (the favourite café of Lwów mathematicians) the quantity of new problems multiplied to such an extent that at a certain moment it was considered advisable to record them in a special notebook which was always kept in the House (to the delight of the waiters, who no longer had to wipe mathematical calculations of the tables). There thus came into being the legendary Scottish Book of great scientific, emotionl and historical value, because of the names of the authors, often distinguished foreigners, who had posed the problems.

The interest "The Scottish Book" had aroused was shown in the fact that in May of 1979 a conference was held in Denton, Texas, devoted to the "Book" and its influence on the development of mathematics. Among the distinguished scholars who read papers at that conference were Professors: Granas, Kac, Ulam and Zygmund, living before in Poland.

Describing the Lwów group of mathematicians one cannot omit the Lwów Technical University and its General Department in particular. The curriculum of that department did not differ much from that of Lwów University, though it made it possible to study engineering subjects taught by other departments. Besides, it was more diversified in mathematical subjects than a normal university curriculum, because it was based to some extent on commissioned courses conducted by Lwów University teachers (e.g. Banach and docents S. Kaczmarz and W. Nikliborc). The General Department had only one chair of mathematics (which was filled by myself in the years 1928—1933, and by W. Stożek before me). Among the graduates of the Department were the afore-mentioned Stanisław Ulam, Jan Blaton (brilliant physicist) and Edward Otto, at present a professor at the Technical University in Warsaw.

During the pioneering period of the development of Polish mathematics following the recovery of independence, Warsaw and Lwów were the most active centres of mathematical thought, although mathematics was also developing in other university centres, though with less impetus and activity. Here one must first mention Cracow, where analysis was cultivated, and where the "Annals of the Polish Mathematical Society" became the main publication.

Stanisław Zaremba, whom we mentioned in Chapter 1, was the leading Cracow mathematician. He was especially famous for his early results in the field of classical analysis. It is to his unquestionable merit that he trained mathematicians of the calibre of Tadeusz Ważewski and Władysław Nikliborc.

Professor Ważewski was an outstanding expert in the theory of ordinary differential equations.

Władysław Nikliborc, later a professor at Warsaw University and an excellent master of analysis, was engaged in the three-body problem, among other things. Unfortunately, his untimely death (shortly after the Second World War) did not allow him to finish his very promising research.

Among the more active representatives of the Cracow centre at that time there were also: Professor Franciszek Leja — a student of Professor Żórawski and a prominent, indeed one of the most distinguished experts in analytic functions in Poland; Professor Hoborski and his student, Stanisław Gołąb (differential geometry), later a professor at the Mining Academy and the Jagiellonian University; Otto Nikodym — known for his fine results in measure theory (he moved to Warsaw after a couple of years and a few years after World War II — to the United States), Alfred Rosenblatt (algebraic geometry and various applications of analysis), who some time later received a chair in Lima, Peru; Jan Śleszyński, a former professor at Odessa and a pioneer of mathematical logic in Cracow; and Witold Wilkosz, who had very wide interests: analysis, the foundations of mathematics, as well as other fields.

In Wilno, the leading mathematician was Antoni Zygmund, professor at the Stefan Batory University from 1930 and an alumnus of Warsaw University, where he graduated as Ph.D. and later docent; he was one of the most distinguished Polish mathematicians and the author of an excellent monograph on trigonometrical series.

Professor Zygmund has educated a great many students in Poland and America, where he has been a professor since 1940. One of the most distinguised of them in the Wilno period was without any doubt J. Marcinkiewicz, one of the most talented Polish mathematicians of the young generation (he perished during the war).

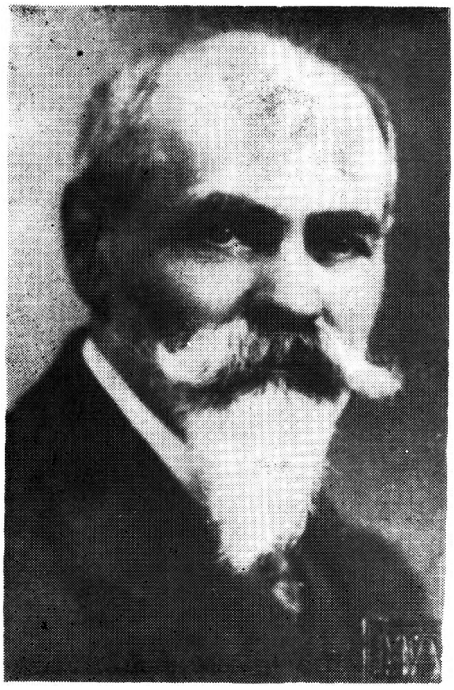
Besides Professor Zygmund, Stefan Kempisty was pursuing rather intensive scientific activity mainly in the field of the theory of real functions.

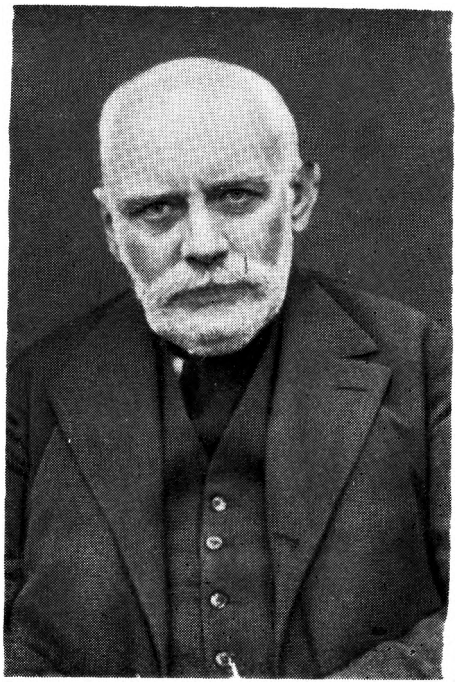
Among the assistants, it is worth-while to mention Mirosław Krzyżański and Stanisław Krystyn Zaremba, Professor Stanisław Zaremba's son, who became professors after the war.

Finally, there were two chairs of mathematics in Poznań, in which was then the youngest Polish university centre (the university was established in 1919). One of them was held (from 1929) by Mieczysław Biernacki, a distinguished scholar, an expert in the theory of analytic functions. Władysław Ślebodziński also played an important part in stimulating scientific activity; he was a professor at the Poznań School of Mechanical Engineering.

A further increase in the scientific status of Poznań took place in the last years before the war, when Władysław Orlicz, then docent at Lwów University, assumed a chair of mathematics.

As a particularly important event for Polish mathematics one should include the establishment of the "Monografie Matematyczne" (Mathematical Monographs) in 1931. This marked a new stage in the development of the Polish School of Mathematics. The previous stage, which may be called the pioneering stage, was characterized by the production of almost exclusively short papers containing new results (and published mainly in "Fundamenta" and "Studia"). However, then came the time to synthesize the results of Polish mathematicians, or to synthesize entire mathematical fields to which Poles made a particularly large contribution. The first volumes of the Monographs contained: functional analysis (volume I — Théorie des opérations linéaires by Banach), the theory of the integral (volume II — Théorie





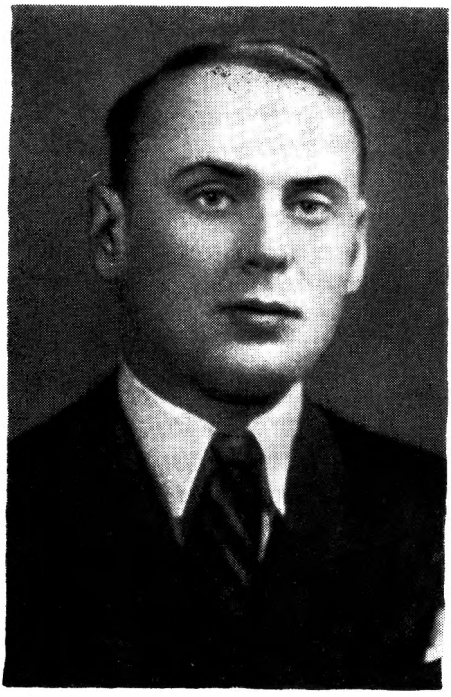
Phot. 1. Stanisław Zaremba (1863—1942)
Phot. 2. Kazimierz Żorawski (1866—1953)
Phot. 3. Wacław Sierpiński (1882—1969)
Phot. 4. Zygmunt Janiszewski (1888—1920)

Phot .5. Stefan Mazurkiewicz (1888—1945)

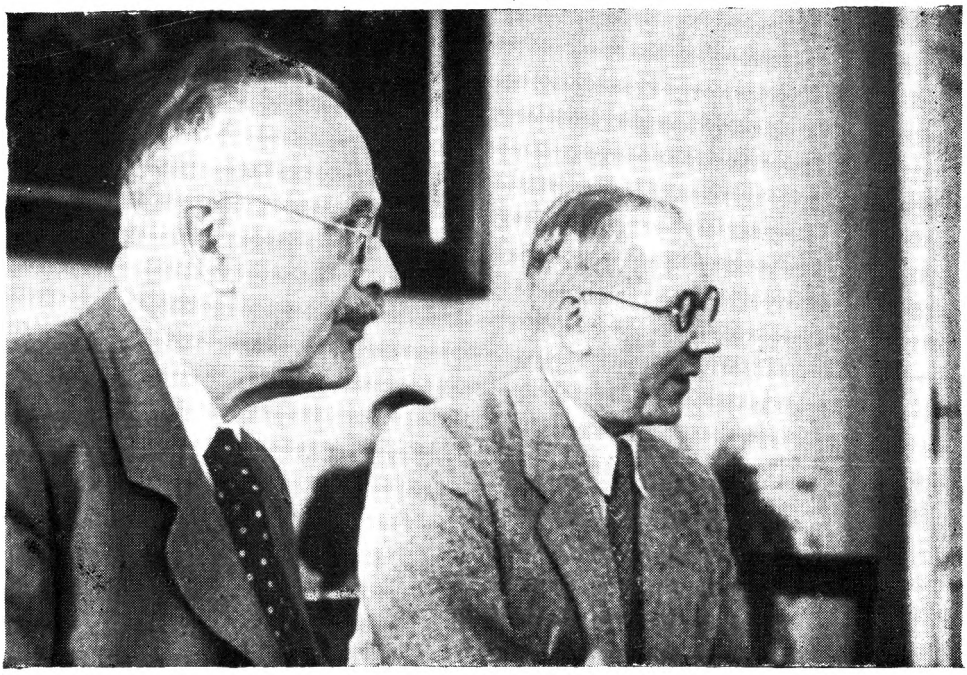
Phot. 6. Hugo Steinhaus (1887—1972

Phot. 7. Stefan Banach (1892—1945)

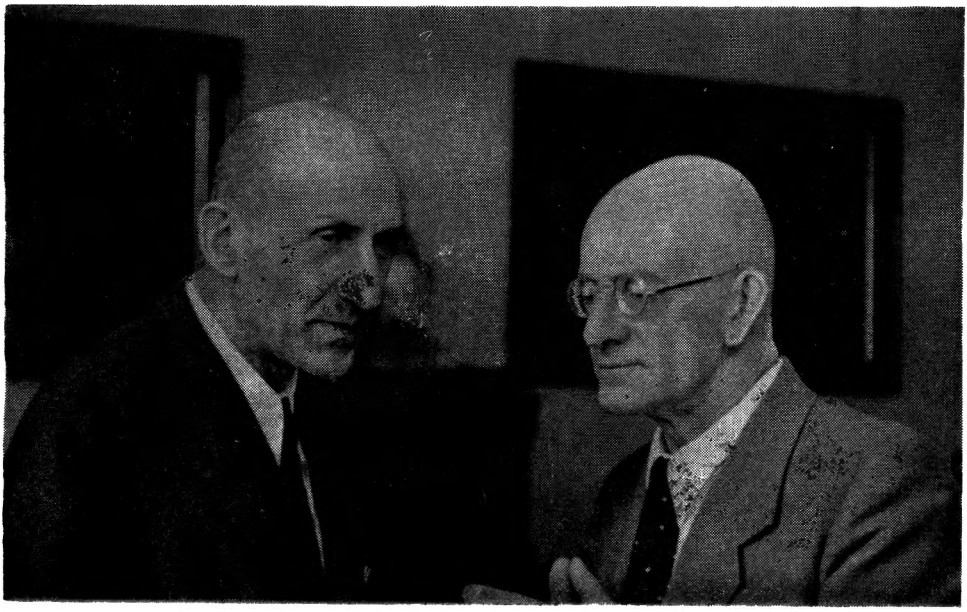
Phot. 8. Stanisław Saks (1897—1943)



Phot. 9. Juliusz Schauder (1896—1943)
Phot. 10. Andrzej Mostowski (1913—1975)
Phot. 11. Edward Marczewski (1907—1976)
Phot. 12. Józef Marcinkiewicz (1910—1940)

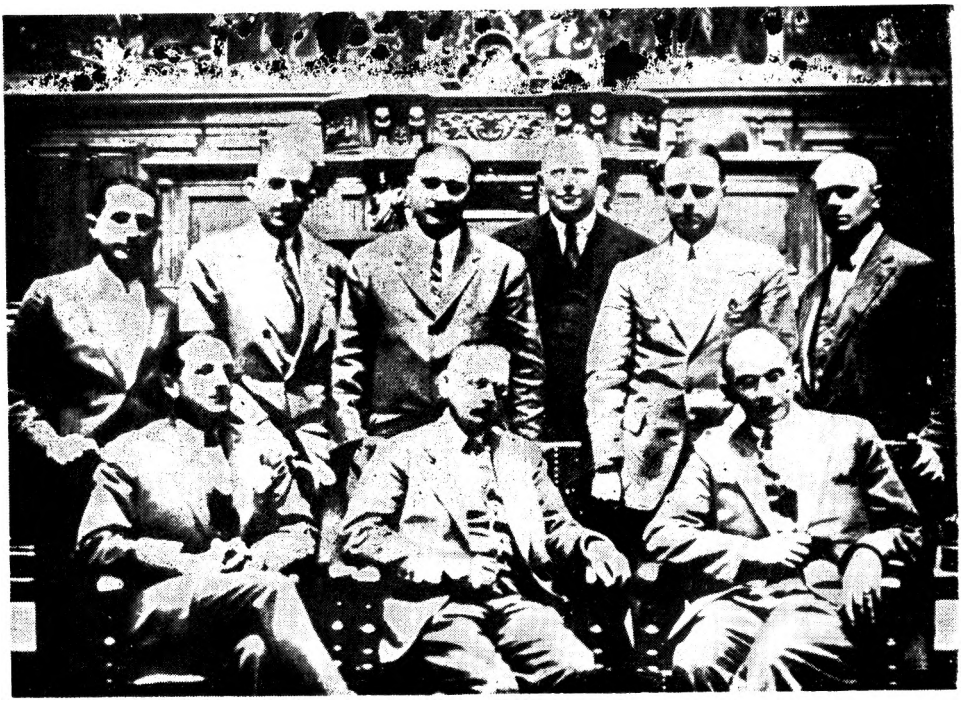


Phot. 13. J. Radon and W. Orlicz (1953)
Phot. 14. Jerzy Spława-Neyman, Warsaw — Symposium, 1974



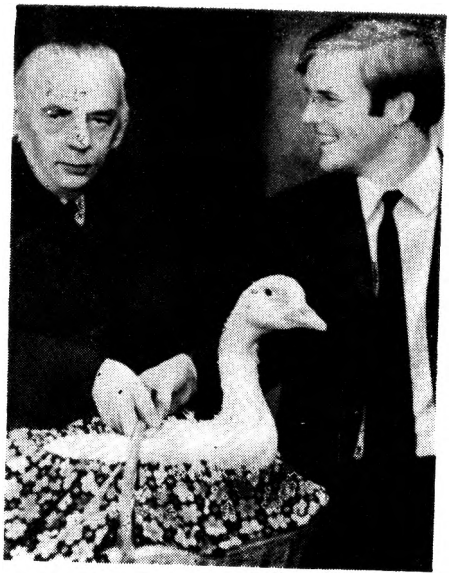
Phot. 15. K. Borsuk and P. S. Alexandrov in Radachówka (1965)
Phot. 16. B. Knaster and P. Alexandrov
Phot. 17. A. Tarski, W. Szmielew

Phot. 18. S. Eilenberg



Phot. 19. Zermelo in Lwów (1930). First row: H. Steinhaus, E. Zermelo, S. Mazurkiewicz. Second row: K. Kuratowski, B. Knaster, S. Banach, W. Stożek, E. Żyliński, S. Ruziewicz

Phot. 20. Cracow mathematicians: T. Ważewski, A. Pliś, J. Szarski



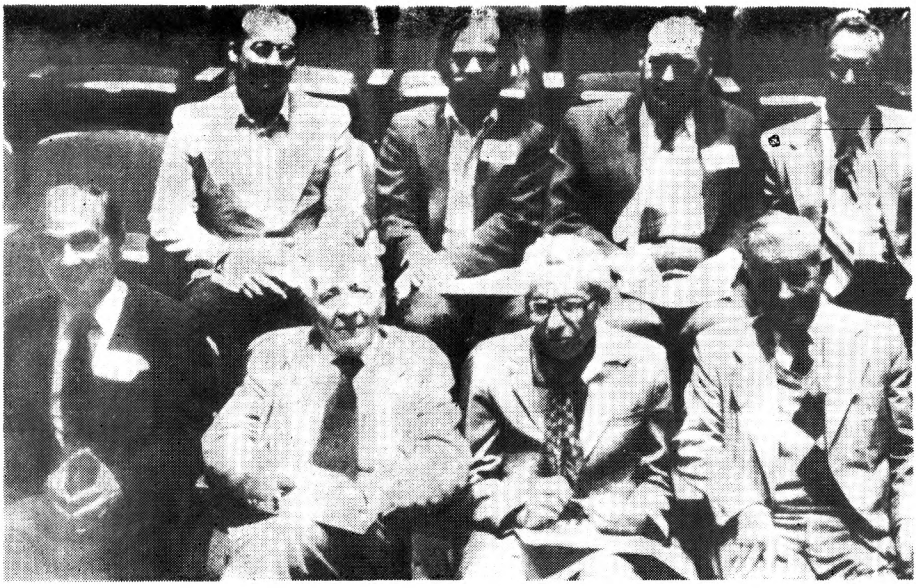
Phot. 21. S. Mazur, Per Enflö and the goose (prize for solving a problem raised by S. Mazur in 1936 in the Scottish Book), 1972

Phot. 22. Function Analysis Conference. Jabłonna 1960. 1. V. Klee, 2. W. Orlicz, 3. Mrs. D. Rolewicz, 4. C. Ryll-Nardzewski, 5. S. Rolewicz, 6. S. Hartman, 7. R. Bittner, 8. R. Sikorski, 9. B. Bojarski

Phot. 23. In Żelazowa Wola, birthplace of F. Chopin (1960). O. Hanner, M. Stark, H. Fast, M. H. Stone, J. Mycielski, S. Mandelbrojt, K. Kuratowski, A. Zygmund

Phot. 24. Polish Mathematical Society, Katowice 1970. J. Szarski, K. Urbanik, T. Iwiński, F. Leja, J. Łoś, H. Rasiowa, K. Kuratowski, B. Bojarski, S. Rolewicz

Phot. 25. 30th Anniversary of the Institute of Mathematics of the Polish Academy of Sciences, 1978. J. Kaczmarek, W. Nowacki, C. Olech, K. Kuratowski, W. Orlicz



Phot. 26. 25th Anniversary of the Institute of Mathematics of the Polish Academy of Sciences, 1973. S. Łojasiewicz, C. Bessaga, K. Gęba, K. Urbanik, C. Lipnicki (secretary), W. Orlicz, Z. Ciesielski, A. Pełczyński, W. Trzebiatowski, W. Mlak, E. Fidelis

Phot. 27 .On the „Scottish Book" Conference. Denton, Texas, May 1979. First row: S. Ulam, M. Kac, P. Erdös, A. Zygmund; second row: R. Mauldin, D. Bellamy, A. Granas, R. D. Anderson

de l'intégrale by Saks), topology (volume III — by the present author), the hypothesis of continuum (volume IV — by Sierpiński), the theory of trigonometrical series (volume V — by Zygmund), the theory of orthogonal series (volume VI — by Steinhaus and Kaczmarz). In a short time, the "Monografie Matematyczne" earned an enviable position among the most respectable scientific publications.

The successive launching of the "Fundamenta", "Studia" and "Monografie"" represent something like milestones on the path of development of Polish mathematics.

The Polish Mathematical Society made a considerable contribution to the development of the Polish School of Mathematics and to the winning by the latter of no mean position in the world of science.

At the weekly sessions of the Society the latest scientific results of its members were discussed, and the congresses held by it were an opportunity for a global review of Polish mathematics, as well as for strengthening contacts with foreign mathematicians.

Among those visiting Poland, some were world-famous, like E. Borel, E. Cartan, A. Denjoy, H. Lebesgue and P. Montel from France, E. Zermelo (the famous author of the axioms of set theory) from Germany, N. N. Lusin, P. S. Alexandrov and P. Urysohn from Moscow, J. von Neumann, S. Lefschetz, M. H. Stone and G. Whyburn from the United States, K. Menger from Vienna, E. Čech from Prague, H. Hopf from Zurich, D. Pompeiu from Bucharest, F. Enriques from Italy, J. Schouten from Holland, Th. Skolem from Norway and many others.

At every international congress there was a numerous group of Polish mathematicians.

3. POLISH MATHEMATICS AFTER THE WAR. DEVELOPMENT PROSPECTS

Looking back at the state of Polish mathematics around 1935, i.e. 15 years after the birth of the Polish School of Mathematics, one could say, that it accomplished a very great deal in a relatively short time: its scientific, editorial and organizational successes placed Polish mathematics among the foremost in the world.

In Warsaw the leading part in mathematics (and not only in mathematics) was played by professors Mazurkiewicz and Sierpiński. Mazurkiewicz, endowed with a great creative talent and brilliant intelligence, was gaining year by year a growing number of students. Sierpiński, being a recognized authority in the whole mathematical world, influenced greatly the Warsaw mathematical milieu. At the seminars he used to read out his correspondence with famous foreign methematicians which acquainted the students with the latest mathematical problems.

In Lwów the whole mathematical life developed around two central figures, professors: Banach, the most distinguished Polish mathematician, and Steinhaus, co-founder — which is a rarity — of two mathematical schools; because apart from the Lwów Mathematical School (as has been mentioned

before), he also greatly contributed (especially after the Second World War) to extensive studies in the field of applied mathematics.

But beside the brilliance there were also shadows, which we had already begun to notice with some concern. That was the one-sidedness of Polish mathematics. Although such fields of mathematics as topology and functional analysis, which were the main interest of Polish mathematicians, began to play a larger and larger role in the whole of mathematics, developing into independent disciplines, their cultivation without a proper development of analysis and algebra, and with the almost complete omission of the theory of probability (a sole exception was here Jerzy Spława-Neyman), was a weak side of Polish mathematics of those days.

The one-sidedness of our mathematics was due to the concentration of scientific research set out in Janiszewski's very conception, a concentration which had been necessary when we were starting out with a small scientific nucleus in 1920. After 15 years the situation had changed. Owing to the substantial growth of our scientific potential we could venture to enter new areas which had previously been neglected or completely unexplored.

In 1936, a Council of Exact and Applied Sciences was formed in Poland; it included a Mathematical Committee. The activities of the latter provide the best evidence of our intentions in that direction, which were to begin a new stage in the development of Polish mathematics.

The Committee viewed as its most urgent task the preparation, together with the Polish Mathematical Society, of a report "On the present state and needs of mathematics in Poland". This report was passed by the Committee and subsequently accepted by the Polish Mathematical Congress in 1937 as a programme of the whole body of Polish mathematicians.

The report stated that the first period of the existence of the Polish School of Mathematics was over. That period, which had begun and was closely connected with the recovery of independence by the Polish State, had been based on the project formulated in Janiszewski's article is supplemented by Mazurkiewicz in the following year; it had been marked by the launching of "Fundamenta Mathematicae" in 1920, "Studia Mathematica" in 1929 and "Monografie Matematyczne" in 1932; this period had led to the full realization of the plans projected for it, as we read in the report.

In formulating its future requirements, the Mathematical Committee submitted the following tasks:

1. "To emphasize as strongly as possible the further cultivation of those fields of mathematics which enjoy a specially high standing in Poland, in order to retain for the Polish School of Mathematics its outstanding position in the world of learning in those fields represented by it.

2. To secure a more vigorous development of classical mathematics, and specially of its insufficiently represented branches (such as algebra and some fields of geometry) and also to raise applied mathematics to such a standard that it can fulfil its tasks as required by other branches of science, as well as those tasks connected with the problems of the country.

In order to achieve these aims the Committee suggested the foundation of two mathematical institutes: one, in Warsaw, concerned with research

(on the pattern of that in Princeton), and the other, in Lwów, concerned mainly with applied mathematics.

Unfortunately, the Mathematical Committee's resolution had no effect. Its reiteration in March 1939, did not work either. After that, it was too late...

War broke out, and with it came the dark night of Nazi occupation.

This period was particularly tragic for Polish science. The enemy purposely destroyed the intelligentsia, seeing in this a means of quickly turning our nation into a nation of slaves. The invader closed down institutions of higher education throughout the country. The purpose of this was to make it impossible for our scholars to perform any scientific work, and for our youth to obtain any education. A perfectly organized clandestine underground educational system was the reply; the elite of our professors and a considerable number of students took part in it.

Almost all our professors of mathematics lectured at those clandestine universities, and quite a few of the students then are now professors or docents themselves. Due to that underground organization, and in spite of extremely difficult conditions, scientific work and teaching continued, though on a considerably smaller scale, of course. The importance of clandestine education consisted among others in keeping up the spirit of resistance, as well as optimism and confidence in the future, which was so necessary in the conditions of occupation.

The conditions of a scientist's life at that time were truly tragic. Most painful were the human losses. More than half of the active mathematicians perished. Among them were such talented mathematicians as Józef Marcinkiewicz, Juliusz Schauder and Stanisław Sachs. To this list must be added two among the most distinguished Polish mathematicians: Stefan Mazurkiewicz and Stefan Banach who died in 1945. They were indirect victims of the war.

After the war a great joint effort on the part of the government, scientists and youth was necessary to bring Polish science back to life. The worst gaps among the teaching staff had to be filled, working conditions for the few scientists who had survived had to be created, and lectures had to be set up for the youth, who wanted to study; the reconstruction of university buildings, libraries and scientific printing houses became an urgent need.

The idea of establishing a Mathematical Institute was then revived, for we realized that to overcome mounting difficulties necessitated something more than a collective effort within the old organizational framework; it was necessary to create a "centre of command", an institution covering the totality of organizational problems (to a large extent, reorganizational problems) on a national scale, and at the same time conducting its own research work, on as large a scale and as comprehensively as possible, according to a plan taking into account the perspectives of development both of theoretical research and of mathematical applications to the natural sciences, technology and economics.

The necessity of a planned organization of Polish mathematics was noted in a comprehensive report of February 25, 1945, addressed to the Ministry of Education by Professor Mazurkiewicz. On May 3, 1945, the first actual

project of the Polish Mathematical Institute was completed by Professors Borsuk and Knaster and myself. Professor Sierpiński, who was then in Cracow, associated himself with the report somewhat later.

The project of setting up a Mathematical Institute was favourably received by the State authorities and got the official assent on November 20, 1948. Thus, from the pre-war concept of two institutes (located moreover in two different towns) one devoted to theory and the other, to practice, we arrived at a concept of an institute homogeneous in its structure and divided into a number of sections, which correspond in principle to individual branches of mathematics, and which constitute proper centres of scientific work or service.

Moreover, from the very beginning of the Institute, there has been a publication division to co-ordinate the activities of all mathematical publications in the country; the Central Library was also founded at the same time.

Almost all the most distinguished Polish mathematicians have been employed by the Institute. Many of them have occupied the posts of division heads, like K. Borsuk, F. Leja, S. Gołąb, E. Marczewski, S. Mazur, A. Mostowski, W. Pogorzelski, W. Sadowski, H. Steinhaus and T. Ważewski.

One of the essential features of the Institute has been its nation-wide character. Naturally, the Institute's headquarters were located in the country's capital; however, the seats of many of the divisions have been placed outside Warsaw, in Cracow or Wrocław, for instance.

Because some divisions have employess at two or three centres, it has sometimes been necessary to establish subdivisions, which have also been directed by distinguished experts; for instance, Professor B. Knaster directed the subdivision of topology in Wrocław, and Professor W. Orlicz directed the subdivision of functional analysis in Poznań.

And now a few formal data:

The director of the Institute, from the moment of its foundation, was (till his retirement in 1967) the author of this article. Then Prof. Roman Sikorski held for a brief while this post, succeeded by Prof. Czesław Olech who holds it now. Prof. Wacław Sierpiński was initially Chairman of the Institute, Scientific Council, then I took over this function.

After the foundation of the Polish Academy of Sciences (in 1952) the Mathematical Institute became one of its first Institutes.

The scientific staff of the Institute consists of 40 professors (including docents) and 60 adiunkts and assistants. Apart from them it includes also 80 holders of doctorate scholarships.

The Institute has no students which accords with its basic idea. It leaves their training to the institutions of higher education. As for the Institute itself it is a research centre in the broad sense of the term. Its scientific work concentrates in 70 seminars which are held every week in different Polish towns. There are precisely the seminars which are that scientific "forge" Janiszewski dreamed of in his vision of Polish mathematics: in them the latest results of their participants are reported and discussed, as well as particularly important results of other writers. The more advanced

students may take part in them which shows that dydactic concerns are not alien to the Institute either.

Owing to a large extent to the Institute's activities Polish mathematics has been able to extend its area of study becoming thus less one-sided that it used to be before the war.

Of course, this does not mean that we have given up cultivating those branches of mathematics which were the domain of the Polish School of Mathematics before the war, and to which we owe our position in world mathematics. These so-called Polish disciplines were: topology, functional analysis, the foundations of mathematics together with set theory, and descriptive set theory. It was fortunate that in each of these disciplines a number of outstanding experts survived the war and could constitute a core around which young enthusiasts for precisely these mathematical disciplines gathered.

Apart from its activities in the area of fundamental mathematics, the Institute is also very concerned with the application of mathematics to technology and economy. Even in the first stages of the Institute's existence, we set up several divisions entirely devoted to applied mathematics, such as the division of mathematical computers, the division of statistical control of the quality of production, the general division of applied mathematics under the direction of Professor H. Steinhaus.

Almost from the beginning of its existence, the Mathematical Institute conducted — at first in Warsaw, under the direction of Docent Tadeusz Iwiński, but now at main industrial centres as well — courses in applied mathematics, intended in large measure for engineers wishing to improve their knowledge of the modern mathematical methods so necessary to them.

Similarly, the graduate studies in mathematical applications conducted by docent E. Fidelis have and will have great practical importance.

There is no doubt that the service role of mathematics was and remains a central interest of institutions representing Polish mathematics, such as the Mathematics Committee, the central body co-ordinating mathematical activities, the Mathematical Institute, the Polish Mathematical Society, universities and colleges. And, what is no less important, the generality of Polish mathematicians, even those with the most abstract interests, fully appreciate the necessity of developing applied mathematics in our country. This state of affairs provides favourable climate for promoting the linking of theory and practice in the field of mathematics and is a negation of the oft-encountered trend towards the pursuit only of so-called pure mathematics.

A great mathematician, and at the same time a philosopher of mathematics, H. Poincaré, distinguished two kinds of mathematical problems: problems which come to us from outside (problèmes qui se posent), and problems which are invented by the author (problèmes qu'on se pose). He considered problems of the first kind to be much more important (these, of course, include those problems put to mathematics by physics, astronomy and other sciences, and, generally, by those disciplines which apply mathematics). However, where the Bourbaki members are concerned, then — according to K. Léray — "the fathers of the Bourbaki movement consider

that such problems are rather outdated"[2]. As Léray states quite firmly and — let us add — quite rightly, this view is contradictory to the present development of mathematics and its applications.

The dilemma of ancient Greece, the question whether along with theoretical mathematics also its applications should be cultivated (such as e.g. mechanics) — does not exist for us. We do cultivate fundamental studies and wish to do so, even if they are extremely abstract, if it is necessary for the mathematics' good, for its progress and its harmony. At the same time we also wish to develop those mathematical branches which serve other sciences and economical progress of the country.

The appearance of volume XXXIII of "Fundamenta" barely a few months after the end of hostilities was one of the pioneer manifestations of the reconstruction of scientific life in liberated Poland. Many of the papers intended for that volume had been composed by the printers back in 1939. They were, however, largely destroyed by the Nazi invaders by order of the German manager of the printing-house, and only some of them survived this vandalism, owing to the exceptional devotion and courage of the persons who saved and preserved them. It also took exceptional devotion and energy to publish that volume in the second half of 1945, following the near-total destruction of the material basis of Polish science. P. S. Alexandrov described the appearance of the "Fundamenta" immediately after the end of the cruel war as "a sort of symbol of the triumph of age-long ideals of human culture and scientific truth over the dark and inhuman aims in the pursuit of which Nazi Germany had tried for six years to reduce Poland to slavery".

Not only the "Fundamenta" but also other publications of ours were being reissued, such as the "Studia Mathematica", "Annale" of the Mathematical Society, "Acta Arithmetica" (devoted to the Theory of Numbers), "Prace Matematyczne" (called "Commentationes Mathematicae"), and even some new ones did appear such as "Colloquium Mathematicum" (in Wrocław) and journals concerned with applied mathematics.

Also the publication of the "Monografie Matematyczne" was resumed and a series of "small" monographs was issued under the title of "Dissertationes Mathematicae" (edited by Karol Borsuk). To these was added the Series of Selected Writings by the now dead distinguished Polish mathematicians; so far have come out in it the "selecta" of Janiszewski, Marcinkiewicz, Mazurkiewicz, Mostowski, Sierpiński and Schauder.

Finally, of major importance to mathematical studies was the inauguration, in 1953, of the mathematical Series in the Bulletin of the Polish Academy of Sciences.

A sore spot of Polish mathematics immediately after the war was the lack of a library. The very rich collection of books had been burned in September 1942.

A couple of months after that event, I succeeded in transmitting this information by means of the Home Army underground radio station to Professor

[2] Cf. his speech on the occasion of receiving the A. Feltrinelli *Prize of the Italian Academy of Science*. "Academia Nazionale dei Lincei" 1972 V. I. 9. p. 194.

Zygmund, who was by then in the United States. As a result of his and his American colleagues' (J. R. Kline, J. D. Tamarkin and others) initiative, we received a rich collection of books shortly after the end of hostilities. That gift, together with the gifts of our Soviet colleagues, who likewise lent us a helping hand very quickly, provided a fairly substantial base for the reconstruction of the mathematics library. It was augmented by the Warsaw Scientific Society's Mathematics Library, which had fortunately survived the war. Thus the Mathematical Institute library became the central book collection of this kind in this country. At present it numbers almost 100.000 items.

Polish mathematicians have always attached great importance to the co-operation with their colleagues abroad. I have spoken about it in Chapter 2.

Lately this co-operation has become particularly intensive as a result of the setting up (in 1972), at the Mathematical Institute, of the International Stefan Banach Centre. The centre holds annually scientific conferences, seminars, and schools with the participation of numerous specialists from abroad. The papers read at the Centre are published in a separate "Series of the Banach Centre."

The Banach Centre has proved to be extremely useful for Polish mathematics and, more generally, for the international co-operation in mathematics. To quote an example: already in the first semester (on fundamental mathematics) 132 participants took part in the Centre, including 79 from abroad.

The head of the Banach Centre is, by virtue of his office, the director of the Mathematical Institute, at present — Prof. Czesław Olech.

Apart from the Mathematical Institute of the Polish Academy of Sciences, which covers the whole country with its activities, considerable contribution to science is being made by university centres of which I should like to say a few words now.

In the Warsaw centre two branches of mathematics are cultivated very intensively: functional analysis and topology.

Functional analysis is represented by a distinguished mathematician, Aleksander Pełczyński (pupil of prof. S. Mazur), his close collaborator, Czesław Bessaga (both are members of the Academy of Sciences), Wiesław Żelazko, Stanisław Kwapień, Przemysław Wojtaszczyk (pupil of Prof. Pełczyński), and many others.

The leading representative of topology is currently one of the most eminent experts in this field, Professor Karol Borsuk. He has introduced into mathematics a number of new notions, now generally used, especially the notion of "shape" (on which a few hundred papers have already been written).

In recent years the very young Henryk Toruńczyk has revealed himself as an extraordinary talent; he managed to solve a problem in topology, that of the infinitely dimensional space that which first posed many years ago.

Ryszard Engelking belongs also to the Warsaw centre and is one of the most outstanding experts, on the world-scale, in general topology. He has got already many pupils of his own, some of which, like T. Przymusiński and R. Pol, have become docents.

R. Pol is closely concerned with the "descriptive set theory", a branch of mathematics bordering on topology and set theory. This branch has quite unusually been revived in the last 20 years in the world, and especially in Poland; this has been probably due to a paper published by C. Ryll-Nardzewski and myself (called often "classical" in selectors theory). The Warsaw (and also Wrocław) centre can boast considerable achievements also in the field of fundamental mathematics and the general set theory — the branch that was developing with such success in the period between two wars. Unfortunately the death of Professor Andrzej Mostowski (in 1975) has been a blow to its further development.

Among the mathematicians connected with the Warsaw milieu let us still mention the following ones: T. Bałaban, R. Bartoszyński, A. Białynicki-Birula, B. Bojarski, J. Kisyński, J. Krasinkiewicz, K. Krzyżewski, J. Łoś, K. Maurin, M. Moszyńska, S. Nowak, Cz. Olech, E. Otto, H. Patkowska, Z. Pawlak, A. Piskorek, H. Rasiowa, S. Rolewicz, D. Przeworska-Rolewiczowa, A. Schinzel, Z. Semadeni, K. Sieklucki, R. Sikorski, A. Suliński, L. Szczerba, Z. Szmydt, A. Trautman, S. Woronowicz, J. Zabczyk.

They represent a wide range of branches, such as homological algebra, Boole's algebra, functional analysis, global and classical analysis, algebraic and differential geometry, computer science, probabilities, theory of numbers, set theory, theory of optimal control theory, topology, etc.

Many of the mentioned professors have talented pupils. A. Schnziel in particular, one of the most distinguished Polish mathematicians and one of the youngest members of the Academy of Sciences, has among his pupils Docent H. Iwaniec who was invited, in recognition of his mathematical talent, to read the plenary paper on the theory of numbers at the Congress in Helsinki (1978).

Apart from Warsaw, two centres: Cracow and Wrocław are scientifically very active too.

The main branch of mathematics cultivated in Cracow is mathematical analysis. Cracow continues in this respect the achievements of Stanisław Zaremba (d. 1942). His outstanding pupil, Tadeusz Ważewski, founded in Cracow a modern school of differential equations (partly making use of topological methods) which can boast remarkable results.

Among the leading mathematicians trained in Cracow are Stanisław Łojasiewicz, Czesław Olech (who moved to Warsaw), and Andrzej Pliś. Apart from them Cracow is represented by: S. Gołąb, W. Mlak, J. Siciak, A. Turowicz and many others, especially among young talented mathematicians.

The Cracow centre has sustained painful losses in the last years. Professors: E. Leja, Z. Opial, J. Szarski, T. Ważewski are dead.

The Wrocław centre came into being in 1945 immediately after the war. Its first mathematical cadres consisted, under the direction of Professor Steinhaus, of Bronisław Knaster (nestor of Polish topologists), Edward Marczewski (subsequently the long-standing rector of Wrocław University), and Władysław Ślebodziński (an eminent representative of differential geometry).

Soon the Wrocław mathematical centre became one of the most active in Poland, and is now noted for the wealth of branches it has been

cultivating (from fundamental mathematics through theory of numbers and harmonic analysis to the theory of probability and applied mathematics).

Its leading group consists of: K. Urbanik and Cz. Ryll-Nardzewski, and with them of: J. Charatonik, R. Duda, S. Hartman, A. Hulanicki, W. Klonecki, J. Łukaszewicz, W. Narkiewicz, L. Pacholski, J. Płonka, A. Rybarski.

During the last decade Wrocław, too, sustained painful losses: E. Marczewski, H. Steinhaus, W. Ślebodziński are dead.

Poznań is the seat of Władysław Orlicz, one of the most brilliant Polish mathematicians, Banach's pupil. Those working with him are: A. Alexiewicz, J. Albrycht, J. Musielak, and others.

At the Marie Curie-Skłodowska University, founded in Lublin in 1944, the leading part is played by Adam Bielecki, as well as by K. Goebel, J. Krzyż, T. Leżański and others.

At the University of Łódź, founded a few years later, should be mentioned among the mathematicians first of all Zygmunt Charzyński, as well as L. Włodarski, R. Jajte, and J. Ławrynowicz.

Among the mathematical branches, extensively represented at the Nicolaus Copernicus University in Toruń, the leading one is algebra with which professors Stanisław Balcerzyk and Edward Sąsiada are concerned.

The most recent universities in Poland are the Silesian University and Gdańsk University.

In Katowice mathematics is directed and looked after by Professor Jan Mikusiński, assisted by Professors Jerzy Górski, Marek Kuczma, Andrzej Lasota, Jerzy Mioduszewski. Apart from them those working at the Silesian Technical University (in Gliwice) are among others, P. Antosik, M. Kucharzewski, and Z. Zahorski.

The Gdańsk mathematical centre came into being still before the foundation of the University there, and was an extension of the Gdańsk Section of the Mathematical Institute of the Academy and of the Higher Pedagogical School. This is a very dynamic centre indeed to which great hopes may be attached; in the field of algebraic and differential topology an important part is played there by Prof. Kazimierz Gęba, and till recently has been by Prof. A. Granas (who is at present in Canada). The general direction of the centre rests in the hands of Prof. Z. Ciesielski, one of the leading Polish mathematicians.

Let us add that Prof. Jan Lipiński (who was before at the Łódź centre) represents the theory of real functions in Gdańsk, and the young doc. T. Figiel — does functional analysis.

In the afore-given list I have tried to mention the most active of the 230 professors and docents of mathematics in Poland. Outside this list remains a considerable number of talented young mathematicians, such as for instance J. Dydak, pupil of Prof. Borsuk, who is sure to find himself soon on the list of docents.

Concluding this review of the activities of Polish mathematics during the last sixty years — the activities which have been witnessed by myself —

I should like to answer the question: what are the prospects for Polish mathematics to maintain its position achieved under the guidance of the great founders of the Polish Mathematical School, Banach, Janiszewski, Mazurkiewicz, Sierpiński, Steinhaus?

In my opinion the answer is positive. And this belief is based on the fact that there are numerous professional cadres of great talent who enjoy — in many cases — international fame. I also believe in our young cadres, growing in strength year by year and who include individuals both exceptionally gifted and enthusiastic. It is this traditional enthusiasm, by the way, which had inspired Janiszewski with his vision and conception of the Polish School of Mathematics and infused into his continuators the will to rebuild mathematics after the terrible ravages of Nazi occupation. Polish mathematics has a real chance — in my view — of maintaining its position in the world, a position it has recovered after the war, has strengthened through its contributions to science and continues to do so.