

photographic atlases of the arc and spark spectra of iron, and then of the most useful lines of the remaining elements—a task which demonstrated Gatterer's endless patience and devotion to precision. These atlases are valued all over the world, and the last of them is one of the few subjects about which there is ever direct communication between Moscow and the Vatican.

In order to obtain pure iron for these reference spectra, pioneer work was done on the purification of iron; the method was eventually applied in an Austrian industrial laboratory in 1938. Another analytical problem which Father Gatterer helped to solve was the spectroscopic estimation of the halogens and of sulphur by the use of high-frequency discharges in vacuum to excite the spectrum. In 1938 Gatterer took the initiative in founding the international journal called *Spectrochimica Acta*, which was published in Germany by Springer, and which continued to appear with the names of its foreign editors on the cover until 1944. In 1947 Gatterer revived the journal and it was published from the Vatican Observatory for two years, after which it was returned to commercial production. Under Gatterer's editorship the printing received the same attention to detail as a spectrum gets.

Father Gatterer was a member of the Joint Commission on Spectroscopy of the International Astronomical Union and the International Union of Pure and Applied Physics; and he was delighted when that Commission and the International Astronomical Union both met in Rome last year, so that many of his friends could visit his laboratory.

Not only natural scientists but also industrial spectroscopists owe much to their contacts with Gatterer, who was an honorary member of national organizations of spectroscopists in both Italy and France. Manufacturers of spectrographs in both hemispheres benefited when he visited them to order apparatus to his own exacting specifications. From the age of twenty-six onwards he suffered from a series of painful illnesses, and he was partly crippled during most of these years. His cheerful fortitude under physical burdens and the humility underlying his devotion to truth made him an inspiring friend and teacher.

E. VAN SOMEREN

Prof. P. Niggli

PROF. PAUL NIGGLI, who died recently in Zurich after only a few hours illness, was born on June 26, 1888. He had been director of the Mineralogical and Petrographical Institute of the Eidgenössische Technische Hochschule since 1920; and he had been also rector of the Highschool during 1929–32, and of the University of Zurich during 1940–42.

Paul Niggli graduated at the Eidgenössische Technische Hochschule in 1907 as an engineer, but he chose to make mineralogy his special subject and studied for a short time at Karlsruhe and later at the Geophysical Laboratory of the Carnegie Institution at Washington and published several papers with G. W. Morey. In 1914 he returned to Zurich, but later in the year he accepted a professorship in mineralogy and petrography at Leipzig and went to Tübingen in a similar capacity in 1918. On Grubenmann's retirement, Niggli was called to succeed him as professor at Zurich in 1920, and there then began the building up of an institute renowned for the high standard of its teaching and research. He was assisted there by a devoted team of able professors

and assistants. Germany made one attempt to lure him back to take the chair of mineralogy and petrography at Charlottenburg, but Niggli decided to remain at Zurich, to the great delight of staff and students, who celebrated the occasion by a torchlight procession in his honour.

Niggli was a man of great ability, wide knowledge, and immense industry. His masters at Zurich were Albert Heim and Grubenmann, and his earliest published works as a student were on the chloritoid schists of the Gotthard massif and a geological map of Zofingen, his own birthplace. A list of his very numerous books and papers was published in the "Festschrift" issued in honour of his sixtieth birthday in 1948. He ranged over the whole field of crystallography, mineralogy and petrography, and sought especially to expound the principles of physical chemistry that apply to the paragenesis of minerals and the differentiation processes and metamorphism of rocks. In his "Geometrische Kristallographie des Diskontinuums" (Leipzig, 1918–19), he brought up to date Schoenflies's "Krystallsysteme und Krystallstruktur" (1891), introducing the new work based on X-ray analysis. This was followed by many papers and chapters in his "Lehrbuch", and others on crystal structure and stereochemistry. He was an editor of the *Zeitschrift für Kristallographie* during 1920–40.

His "Lehrbuch" (Berlin, 1920) ran to three editions; but each 'edition' was really a different book presenting various parts of the subject of crystallography and mineralogy from new angles and in the light of new knowledge. Unfortunately, Part 3 of the third edition, written in 1944 and set up in type, was twice destroyed in Berlin during the War, and Niggli had not the heart to write it again.

Petrology and the working out of methods of handling and studying the mass of chemical data available on igneous and metamorphic rocks, and the application of physical chemical principles and phase rule to the problems, figured largely in his work at Zurich. He collaborated with Grubenmann in a new book on metamorphism (1924) and with Burri in a vast survey of the mineral-chemical characters of the younger eruptive rocks of the Mediterranean orogeny, covering, in fact, a region stretching from America eastwards to the western shores of the Pacific. This work, in which more than two thousand chemical analyses were handled, used to the full Niggli's method of recalculating analyses in 'Niggli values', a method which, together with his later system of molecular norms and his graphical methods for comparing and exhibiting chemical characters of rocks, have all had considerable influence on petrography throughout the world.

Niggli was somewhat reserved in manner, especially in later years. Much of his writing was in rather difficult German, and he rarely wrote in English although he spoke it fluently. His great ability received world-wide recognition. He received honorary doctorates from the Universities of Stuttgart, Budapest, Liège and Sofia; he was given the Hayden Award of the Philadelphia Academy of Natural Science, the Roebing Medal of the Mineralogical Society of America, and the Orville Derby Medal (Rio de Janeiro), 1952. As a corresponding or honorary member he had been elected to no less than twenty-seven academies and societies, including the Geological Society of London and the Mineralogical Society, of which he was the senior honorary member, having been elected in 1933.

W. CAMPBELL SMITH