

showed the practicability and resulting advantages of working both transmitter and receiver in the same reflector, and satisfactory two-way communication was maintained for several hours over the distance of 23 miles. Soon after this demonstration, the Vatican authorities decided to adopt this system for telephonic communication between the Vatican City and the Palace of the Pope at Castel Gondolfo, near Rome. The distance between these two points is more than twelve miles entirely overland, and the direct line between them is obscured by intervening trees. The apparatus has now been installed, however, and is giving satisfactory operation on what constitutes the first commercial radio link on a wave-length of less than one metre.

For the purpose of carrying out long distance tests, a more powerful transmitter was developed, comprising a five-unit reflector with a four-unit transmitter. A standard receiver with single reflector unit was installed on the yacht *Elettra*, and after preliminary tests over distances up to 28 miles, preparations were made for tests over longer ranges. The transmitting equipment was installed in an obsolete observatory at Rocca di Papa, near Rome, at a height of 2,500 ft. above sea-level and about fifteen miles inland. Under these conditions the maximum optical range as set by the curvature of the earth, for a rectilinear path between transmitter and receiver, was 52 miles.* In August 1932, duplex communication was established on a wave-length of 57 cm. between this station and the yacht at a distance of 18 miles. Satisfactory communication was continued at

distances up to 58 miles, beyond which the signals became subject to slow and erratic fading, although they were still perceptible up to a distance of 110 miles.

After a repetition of the above test, in which the maximum range of perceptible signals was 125 miles, the receiving apparatus was installed on Cape Figari, Sardinia, at an altitude of 1,100 ft. above sea level. The distance between Rocca di Papa and Cape Figari is 168 miles whilst the optical distance, taking account of the heights of the two places, is only 72 miles.* When tested under these conditions, signals were immediately received from the transmitter, although they were subject to the same slow deep fading observed on the yacht. Excellent intelligible speech was received during the strong periods of the signals, but these became practically inaudible during the weak periods. This test lasted from about 4 p.m. until midnight, and the average signal strength appeared to be greater before than after sunset. On investigation at Cape Figari, it was found that the waves were arriving from a horizontal direction.

In conclusion, it may be said that these investigations serve to illustrate some of the practical possibilities of the application of electric waves, less than one metre in wave-length, in the field of radio communication.

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* These values for the optical range, as given by the Marchese Marconi, do not appear to be correct. For the height of transmitter given, the range to sea-level is about 63 miles, while to the receiver at the height stated above, the optical range is 105 miles. It may also be pointed out here that ranges in excess of the optical distance have previously been obtained for radio telephonic communication on wave-lengths between 5 and 8 metres (see *Proc. Inst. Radio Eng.*, 19, 485, 1325, 1931).

Humour and Humanism in Baeyer's Laboratory

PROF. H. RUPE entered the private laboratory at Munich, as assistant to Baeyer, in 1891. At that date the great indigo problem had been solved, but the classical work on the reduction of the phthalic acids was still in full swing. These investigations, so well known in the abstract because of their bearing upon the constitution of benzene, take on at once a rich vesture of human interest to the reader of Prof. Rupe's delightful reminiscences of life in Baeyer's laboratory which have recently been published*. The work was beset with difficulties. At one time, for example, during the intensive search for dihydrophthalic acids, gigantic quantities of sodium amalgam, up to forty kilograms a week, were prepared and used in vain. The author remarks with feeling that the situation became very disagreeable to the assistants. It must have been, indeed, a "schwere, scheussliche und gefährliche Arbeit"; but no labour was too tedious for the Master and his band of devoted helpers. There was, as Prof.

Rupe says, something of the magnificent in this prolonged contest with matter.

Eventually, however, even Baeyer was supersaturated with these hydrogenations ("übersättigt von diesen Hydrierungsarbeiten"), and the sorely tried assistants hailed with deep relief the transference of his interest to succinylsuccinic ester and diketocyclohexane. By means of a 'Kunstgriff' of which Baeyer was very proud (treatment with sodium amalgam in presence of sodium bicarbonate), the diketone was reduced to quinitol. At the first glimpse of the crystals of the new substance Baeyer ceremoniously raised his hat!

It must be explained here that the Master's famous greenish-black hat plays the part of a perpetual epithet in Prof. Rupe's narrative. As the celebrated sword pommel to Paracelsus, so the 'alte Melone' to Baeyer: the former was said to contain the vital mercury of the medieval philosophers; the latter certainly enshrined one of the keenest chemical intellects of the modern world. Hats are not associated as a rule with chemical research, although it is true that Trautschold's illustration (1842) shows the striking variety of headgear which was to be seen in

* Adolf von Baeyer als Lehrer und Forscher: Erinnerungen aus seinem Privatlaboratorium. By Hans Rupe. (Sammlung chemischer und chemisch-technischer Vorträge, herausgegeben von Prof. Dr. H. Grossmann, Neue Folge, Heft 15). Pp. 26. (Stuttgart: Ferdinand Enke, 1932.) 2.50 gold marks.

Liebig's original laboratory at Giessen: these choice pieces, although perhaps not including an 'alte Melone', ranged from the postman's cap of Ortigosa the Mexican through the tam-o'-shanter of his unnamed neighbour to the stylish topper favoured by A. W. Hofmann. It now appears that the tradition of laboratory hats descended from Liebig to Baeyer. However that may be, Baeyer's head was normally covered. Only in moments of unusual excitement or elation did 'the Chef' remove his hat: apart from such occasions his shiny pate remained in permanent eclipse.

When, for example, the analysis of the important diacetylquinitol was found to be correct, Baeyer raised his hat in silent exultation. Soon afterwards the first dihydrobenzene was prepared, by heating dibromohexamethylene with quinoline: Baeyer ran excitedly to and fro in the laboratory, flourishing the 'alte Melone' and exclaiming: "Jetzt haben wir das erste Terpen, die Stammsubstanz der Terpene!" Such is the picture from behind the scenes of the dramatic way in which the Master entered upon his famous investigations on terpenes.

Incidents of this kind may appear to be slight, and yet cumulatively they throw a stream of light upon the personality of this great chemist. There is no doubt, for example, that at times 'the Chef' was unduly impulsive. One morning he burst into the private laboratory, and, without having lit his cigar (an indication in itself of unusual emotional disturbance), raised the ancient 'Melone' twice, and exclaimed: "Gentlemen [the audience was composed of Claisen and Brüning], I have just had word from E. Fischer that he has brought off the complete synthesis of glucose. This heralds the end of organic chemistry: let's finish off the terpenes, and only the smears ('Schmierer') will be left!" Prof. Rupe's reminiscences are rich in snapshots of this kind, which are often more revealing than pages of formal description could be.

Baeyer's customary tools were test-tubes, watch-glasses, and glass rods. As an example of his endless patience, Willstätter relates having seen him keep a test-tube in gentle play over a flame for three-quarters of an hour when activating magnesium with iodine. He valued at least three things which were deemed of fundamental importance by the alchemists; for he impressed upon his students that the essential attributes of the chemist are patience, money, and silence. His lectures were marked by clearness and simplicity of diction, with occasional delicate touches of North German humour or sarcasm. He urged his listeners to learn to think in terms of phenomena; and, like Kekulé, he emphasised the importance of giving occasional rein to the imagination: "so viele Chemiker haben nicht genügend Phantasie".

Although 'the Chef' was often regarded as stiff, unapproachable and severe, he was in reality a kindly man who did much good by stealth. He was free from vanity; and, unlike many men of

learning, he was always ready to acknowledge ungrudgingly the merits of others. Baeyer favoured the use of simple apparatus, and the introduction into his laboratory of any device savouring of complexity had to be undertaken with great tact. The first mechanical stirrers, worked by water-turbines, were smuggled in one evening. On the following morning, 'der Alte' beheld them in full working order. For a time he affected to ignore them; then he contemplated them unwillingly, with an air of challenge; next came the first remark, so anxiously awaited: "Geht denn das?" "Jawohl, Herr Professor, ausgezeichnet, die Reduktionen sind schon bald fertig." The Herr Professor was finally so much impressed that he took the exceptional step of summoning the Frau Professor. 'Die Lydia,' as she was called in the laboratory, stood by the merrily clattering apparatus for a while in silent admiration; then she uttered these unforgettable words: "damit müsste man gut Mayonnaise machen können"! What a great deal depends upon one's point of view!

These truly fascinating pages afford glimpses also of the personnel surrounding 'the Chef'. Among them, Herr Leonhard, the old Bavarian factotum inherited by Baeyer from Liebig, stands out by reason of his liberal attitude towards the ethics of lecture demonstrations. Upon occasion he triumphed over his scruples to 'help' his experiments in their fight against the malignity of matter ("Tücke des Objektes")—that bane of the whole race of lecture-assistants: as witness his dry reply to a remark upon the difficulty of making chloroform from alcohol and bleaching powder: "Wissens Herr Doktor, dös Chloroform, dös is schon do herinnen"! There was also the old 'Laboratoriumdiener', Carl Gimmig, a veteran zouave of the war of 1870, with his compelling six-o'clock cry: "Ihr Herre, s'isch Zeit!" If the workers lingered, Carl remorselessly turned off the gas at the main and became 'terribly evident'. There is, too, an instantaneous snapshot of a 'filia hospitalis' of the laboratory, the fair daughter of Herr Inspektor Fehl; but of her it may be said, as of her prototype in the song so beloved of German studentry, that "die Füßchen laufen wie der Wind" off Prof. Rupe's pages.

A narrative of this kind cannot fail to reflect something of the personality of the author, and in the concluding relation of the surreptitious help he once extended to a would-be pharmacist, overcome with 'Examenangst' (expressive word!) in Baeyer's 'Bleikammer', we obtain a glimpse of Prof. Rupe's innate kindness of heart.

"Chemistry has always seemed to me such a *dead* subject—so utterly devoid of human interest!" exclaimed a classicist within the hearing of the present writer the other day, as he stepped somewhat reluctantly into a lecture on alchemy. May he and others who share that mistaken view seek a truer orientation in this matter from such writings as these sparkling reminiscences of life and labour in the laboratory of Adolf von Baeyer.

JOHN READ.